MAY, 1940

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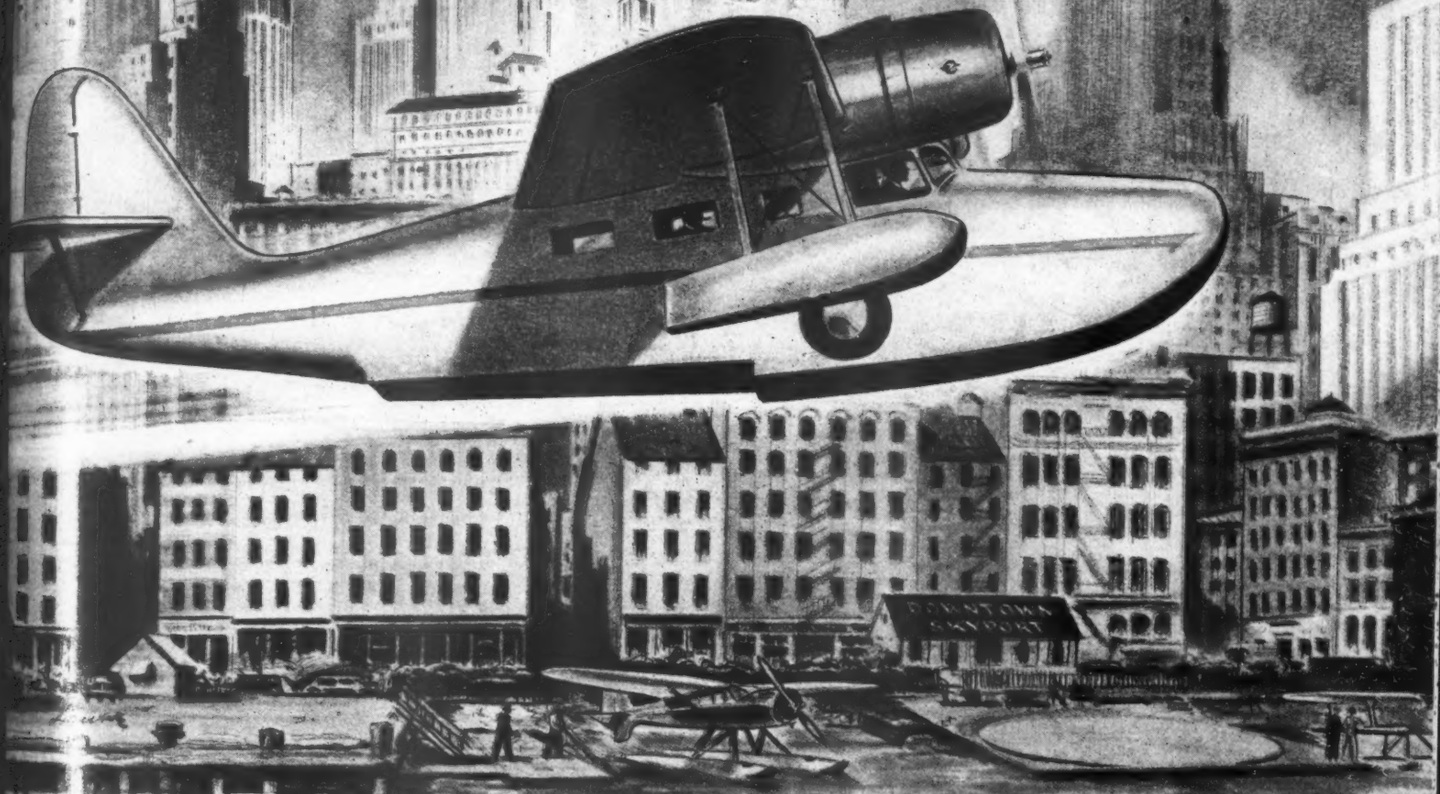
In This Issue
SEA PLANE FLYING HITS NEW HIGH

# AVIATION

*The Oldest American Aeronautical Magazine*



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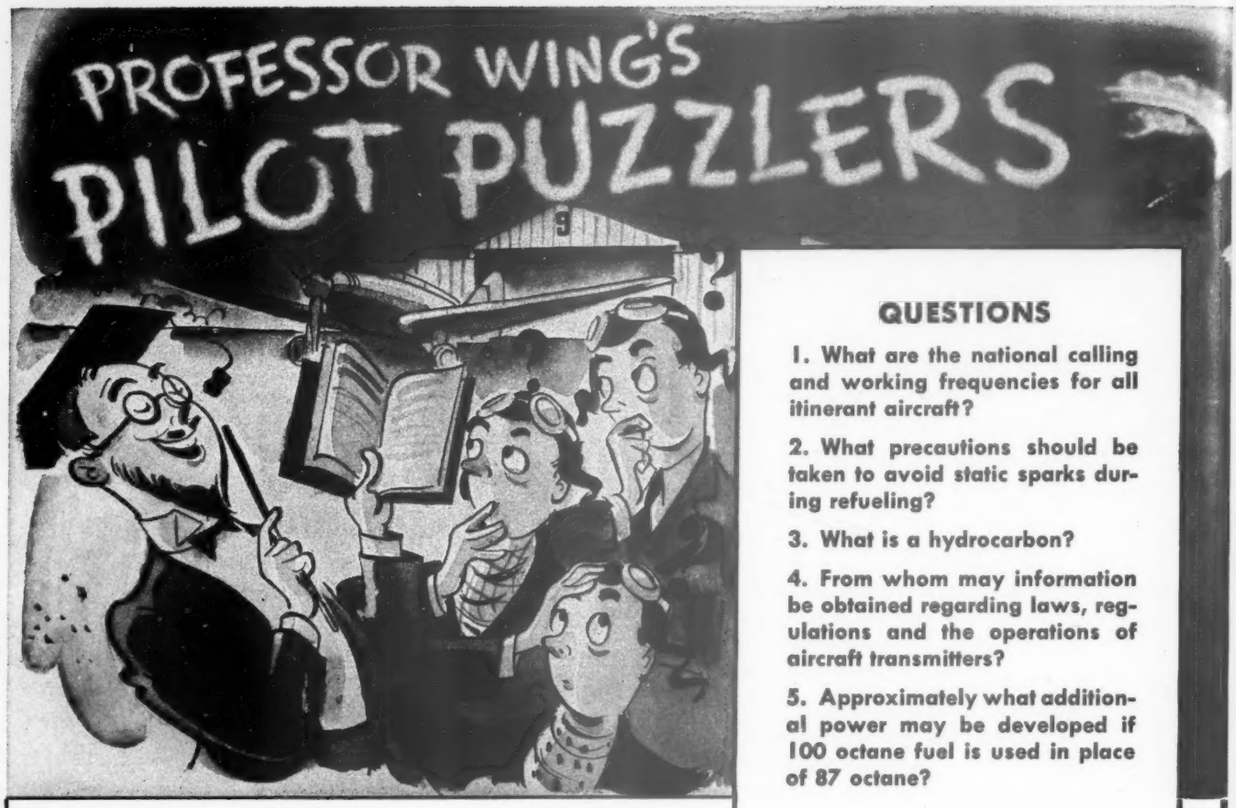


## QUESTIONS

**1. What are the national calling and working frequencies for all itinerant aircraft?**

**2. What precautions should be taken to avoid static sparks during refueling?**

**3. What is a hydrocarbon?**

**4. From whom may information be obtained regarding laws, regulations and the operations of aircraft transmitters?**

**5. Approximately what additional power may be developed if 100 octane fuel is used in place of 87 octane?**

EXPERIENCED pilots have found that for better all-round performance . . . economic warm-up, quicker throttle response, greater cruising range . . . a *balanced* gasoline is needed.

Shell—long a leader in the development of aviation fuels and lubricants—offers private and commercial fliers a balanced gasoline that gives you quick starting, instantaneous response to the throttle during the take-off and climb, and, in addition, low fuel consumption.

Why not call on Shell's wide aviation experience for the answer to your fuel and lubrication problems? Just call or write Shell Aviation Department, 50 West 50th St., New York City; Shell Building, San Francisco; Shell Building, St. Louis.

## ANSWERS

**1** 3105 kilocycles (civil) and 4495 kilocycles (military). The 6210-kilocycle frequency is also coming into use.

**2** The aircraft should be first reduced to earth potential as soon as it touches the ground, either through the tail skid or, in the case of planes with rubber-tired tail wheels, through a trailing ground wire. Also, to insure that there is no chance of sparking through differences in static potential between the plane and the refueling outfit, every component of the refueling outfit must be completely bonded or, in other words, in complete electrical contact. A static electric bond between the refueling equipment and the plane may be maintained either through a separate bonding cable attached to some metal part of the plane, or through a static wire embedded in the carcass of the refueling hose, thus equalizing the potential between the plane and the refueling unit.

**3** A hydrocarbon is a compound composed exclusively of hydrogen and carbon. Petroleum products are composed of hydrocarbons.

**4** From the Federal Communications Commission, Washington, D. C.

**5** The increase in power output will be approximately 15-30 per cent, depending on the engine used. It should be emphasized that either engines especially designed for 100 octane fuel or alterations in existing engines are necessary to realize a safe increase in power output. The amount of increased power derived from existing engines will largely depend on the alterations made, chiefly higher compression ratio or higher intake manifold pressure, and, if necessary, the strengthening of certain parts. When increasing the intake manifold pressure, it will sometimes be found that the increased power output is limited by the increase in the ingoing charge temperature which normally follows an increase in super-charger pressure unless intercoolers are used.

SHELL

AVIATION PRODUCTS

# AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

Established 1916

**MAY 1940**

Vol. 39, No. 5


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History was made when the XPBM-1 first took to the water—and the air. Here is the step that bridges from aircraft that are ships—to ships that are aircraft! A veritable sea-going aerial destroyer! With complete living accommodations for the crew, this newest Martin development for the Navy makes possible sustained operations away from a fixed base aflight and afloat.
THE GLENN L. MARTIN COMPANY, BALTIMORE, MARYLAND, U. S. A.
BUILDERS OF DEPENDABLE
TRADE
MARK
AIRCRAFT SINCE 1909

# Flashes

## Picked Up Along Editorial Airways

### BACK TO THE DARK AGES?

» WITH NO MORE WARNING than was sounded in Europe's most recent "blitzkreig," the White House issued an order last month that shocked the industry throughout its length and breadth, brought strong protests from aviation people to Washington, and made New Deal Congressmen join forces with their Republican opponents in violent objection. On the face of it, the order was simply a part of Reorganization Plan IV and recommended changing C.A.A. to C.A.B. (Civil Aeronautics Board) and abolition of the Safety Board. But the part that hurt most was the assignment of budgetary, personnel, and other controlling elements of the Board to the Secretary of Commerce. Opponents of the plan remembered the dark days of the old Bureau of Air Commerce and felt that the new set-up would destroy the independence of the Authority which was the basic objective in its creation and which was written into the Civil Aeronautics Act at the insistence of the President himself.

Just why the President has reversed his stand on the independence of the C.A.A. no one seems to have discovered,—least of all Senator Pat McCarran, father of the Act, who was summoned frequently to the White House during the framing of the bill to be properly impressed with the desirability of independence for the new federal body. The Senator from Nevada has registered strong objections and has introduced a resolution against the adoption of the order.

It is too early to make a complete appraisal of this move which came as a surprise even to those members of the Authority nearest to the White House. If it may be interpreted simply as the result of the recommendations of the Brownlow Committee, it is unfortunate that aviation should be made a guinea pig for academic experimentation in government reorganization, particularly when the experiment may impair the operation of a successful existing agency. From the standpoint of the Administration it would appear to be exceedingly unwise to take any steps at this time which would have the appearance of tampering with the safety functions of the Authority. Such action, in the light of the brilliant airline safety record, might easily start a storm of public protest that would make the air mail contract cancellation ruckus look like small potatoes in comparison.

In the brief period of its existence the Civil Aeronautics Authority, the Administrator, and the Safety Board have done a conscientious job. They have made a sincere effort to cooperate with the industry in the solution of its many problems. And they have burned plenty of midnight oil in the process. It may be possible to effect the proposed reorganization without serious impairment of the personnel and functions of the Authority. But whether or not this can be done depends directly upon the degree to which the Board can be kept free of the politics usually associated with the Department of Commerce. No matter what happens, no stones should be left unturned to oppose a return to the chaos and demoralization of the

**Research Leaders: Dr. Joseph S. Ames, retired chairman; Dr. Vannevar Bush, present chairman; and Dr. George W. Lewis, Director of Research, have been important contributors to the twenty-five years of N.A.C.A. progress.**

BUILDERS OF DEPENDABLE AIRCRAFT SINCE 1909 TRADE MARK

PENNSYLVANIA-CENTRAL AIRLINES CORPORATION

ALLEGHENY COUNTY AIRPORT PITTSBURGH, PENNSYLVANIA

March 25, 1940

THE B. G. CORPORATION,
136 West 52nd Street,
New York, N. Y.

Gentlemen:

You will probably be interested to know that we are standardizing on the use of B. G. # 417-S Spark Plugs in our Pratt & Whitney Wasp S1H1-G Engines. After service testing these spark plugs for approximately one year, we are convinced that they are very well suited to our operation. The fact that we average a take-off approximately every 44 minutes brings about a very severe operating condition.

Very truly yours,

PENNSYLVANIA-CENTRAL
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Luther Harris,
Sup't of Maintenance &
Engineering.

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IT PAYS TO FLY

# THE BG CORPORATION

*Contractors to the United States Army, Navy and Coast Guard and Aircraft Engine Builde*

old Bureau of Air Commerce of the middle thirties.

» TWENTY-FIFTH BIRTHDAYS are rare in an industry as young as aviation, yet the past month marked a quarter-century point for the National Advisory Committee for Aeronautics. Since its establishment by President Wilson in 1915, the N.A.C.A. has grown from a bare idea to a government research institution which merits an important place among its counterparts in the other great nations of the world. The going hasn't always been easy. There have been times when pursestrings were controlled by those to whom basic research was a mystery and the N.A.C.A. meant nothing more than the name of a brand of cowling. There has been misunderstanding and attacks from those incapable of appreciating the necessity of long range research planning. But the N.A.C.A. has always come through. The present European war has provided a new appreciation of the need for fundamental scientific information in aeronautics. It has revealed to those heretofore uninterested, the vast research facilities of the totalitarian nations where such necessities are created without waiting for popular approval.

In a few months the new Ames Laboratories at Sunnyvale, Calif. will be in operation, supplementing the present facilities at Langley Field, Va. Later a new engine laboratory will be added. A new program to coordinate the work of the N.A.C.A. with that of industrial and educational laboratories is also underway.

Surely the N.A.C.A. has much of which to be proud on its twenty-fifth birthday. And the nation has an added sense of security in the knowledge that the quality of our research is second to none in the world.

» WE HAVE EATEN DINNERS GALORE and listened to speeches long and short in celebration of the air lines' first year of safety. Air line executives have grown weary under the burden of awards, testimonials and certificates commemorating this important accomplishment. Maybe it has been carried a little too far. The safety record is magnificent beyond question. It has been an important part of the great progress of air transportation in the past year. But let's not forget the other parts,—the phenomenal increase in traffic and the three million dollar profit. Then, if there ever should be another accident, it will not be quite so hard for the public and ourselves to take.

» IN THE COURSE OF A RECENT TRIP through the famous Henry E. Huntington library at Pasadena, California, we learned that one of the world's greatest collections of rare aviation books, prints, and portraits has been assembled there and is available to qualified readers and researchers. Nucleus of the aeronautical library is the Maggs collection, which includes books from 1650 through 1920, and covers especially the nineteenth century. Over 1500 items from the Maggs collection, plus 200 since added, are available.

» NEW FEATURES beginning in this issue include a monthly column of advice to private pilots by Jerry Lederer, of Aero Insurance Underwriters, whose news letters are already well known around the airports, and a new column presenting the private pilots side of the picture by a well-known member of this group who prefers to remain anonymous. A monthly financial feature by Selig Altschul, including Barron's aviation index published by special permission, also begins in this issue.

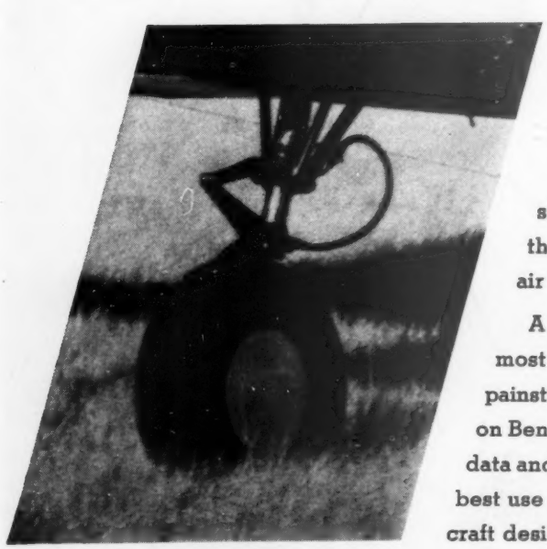
## IT PAYS TO FLY

**"Maguire has been flying high without a pressure cabin."**

## CESSNA SAYS:

# "Viceless landing characteristics!"

*"matchless ground control, while soft oil-and-air type, extra-long shock struts cushion the roughest fields."*



THE natural enthusiasm of the designer and builder for this brilliant Cessna T-50, are evident in the above remarks on its performance, quoted from Cessna's description.

The Bendix Pneudraulic Shock Struts, so largely responsible for these "viceless landing characteristics," bring this highly desirable type of ground maneuverability to air transport and military aircraft with equal facility.

A very large percentage of such airplanes, which are most discussed because of outstanding performance, are painstakingly engineered to land, taxi and take off smoothly on Bendix Pneudraulic Shock Struts. Bendix landing-gear data and the specialized engineering competence to make best use of this data, are at the free disposal of every aircraft designer.

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**South Bend, Indiana**

AIRPLANE WHEELS, BRAKES, PNEUDRAULIC SHOCK STRUTS, TAIL WHEELS, PILOT SEATS

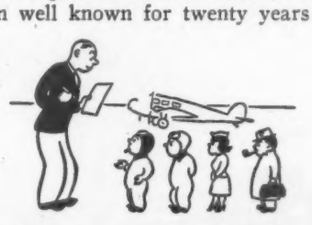
# Side Slips

By ROBERT OSBORN

» ACCORDING to the *New York Herald Tribune* the Safety Board of the Civil Aeronautics Authority has reported that pilots with less than 200 hours of flying time were responsible for 47% of the non-air-line accidents investigated. They recommended that the public should be careful in its selection of pilots for flying and suggested asking for the pilot's certificate when in doubt.

This is certainly good advice but we do hope the C.A.A. doesn't start requiring a pilot to display his license and photograph in the airplane, as is now generally required of a taxicab driver. Every such photograph we've seen so far has made the taxi driver look like Public Enemy Number One, and we're sure a similar requirement for an airplane pilot would have the same effect,—limiting passenger traffic to individuals wearing very thick glasses.

» THE PAPERS are making a big fuss over the fact that an eighty pound midget, living in Boston, has just obtained a pilot's license. Shucks, it has been well known for twenty years in



the aircraft industry that midgets must have been used for pilot, crew, and passengers in obtaining the advertised performance of almost all airplanes.

» IN the late-lamented Russo-Finnish War we're glad that the first practical test of dropping soldiers by parachute didn't work out so well. Reports stated that the soldiers were easily picked off by the ground troops they were supposed to surround. We've never relished the idea of a parachute jump all by itself, without having to duck and try to assemble a machine gun at the same time. Even if they got around to dropping us inside of a concrete pill-box or a whippet tank, we wouldn't like it.

» THE ARMY'S ANNOUNCEMENT of the new big bomber being built by the Douglas Company is certainly interesting,—seventy tons, two hundred and ten foot span, cruising range of more than six thousand miles, and more than fifty per cent bigger than the Dornier DO-X.

» WE'RE wondering if the structural engineers of the Army and Douglas took into account the fact that any airplane that size should be designed to withstand earthquake shocks as well as air and landing loads?

» SPEAKING of that 210 foot span,—we're betting it isn't listed on the Douglas drawings as exactly 210 feet. We've never yet found an aeronautical draftsman who could resist putting down exact dimensions, no matter how impractical they might be. So we have a hunch that the dimension on the drawings is 210.4625 feet or some similar figure.

» THE NAVY is now considering the construction of a dirigible aircraft carrier for use in coastal patrol. This dirigible is to have long range, possibly three times the speed of surface craft and, according to newspaper description, would never be used itself for direct attack on an enemy base. It would carry aircraft which would either be launched for making the attack on an enemy coastline or for the patrolling of our own coast line.

This all sounds practical enough except for one thing,—the matter of piping the Admiral, and his flying barge, aboard, with the dirigible's officer and his side boys standing at attention around a large opening in the bottom of the dirigible. We've seen too many officers knocked flat by their own swords while standing still on dry ground. Of course they might wear parachutes and inflatable vests, in case of errors, but we doubt that the extra equipment would go very well, sartorially, with cocked hats and gold braid.

» WITH the great influx of foreign and domestic orders, the difficulty of obtaining materials, the turnover in experienced employees, and the necessity for financing plant expansions and machinery purchases, we are sure that all airplane manufacturing executives have plenty of headaches these days. Accordingly we'd like to pass along a helpful bit of poetical philosophy composed by Ed. Noonan:

"When in trouble,
When in doubt,
Run in circles,
Holler and shout."

» WITH a hot political campaign just getting under way we're surprised that the recent sun spots which disrupted all telegraph and radio service, including the radio activities of the airlines, haven't been blamed on either political party by the other.

# TAKE TO THE WATER

**By Carl Norcross**
*Assistant Editor*

**Operators are missing a bet if they fail to follow crowds to the waterfronts, where substantial profits may be had from a seaplane base.**

PAUL REVERE'S old slogan of, "One if by land, and two if by sea," might well apply to the operator's share of profits from a fixed flying base. As flying on floats becomes more popular every year, operators who are moving their bases to the water fronts are reaping a very practical harvest. Seaplane operation is striking a responsive chord with the American public, which seems ready and willing to pay cash for the fun of flying on the water.

The coming summer should be the best in history for seaplane operators. In the past year under the direction of CAA's Major A. B. McMullen, the joint CAA-NYA seaplane base program has added some 300 floats at strategic spots throughout the country and there will be more soon. This gives a seaplane pilot something that he has always needed—an easy way to get himself and his passengers ashore,

**A summer scene in Port Chester, N. Y., where Long Island Sound offers miles of waterfront for seaplane pilots.**

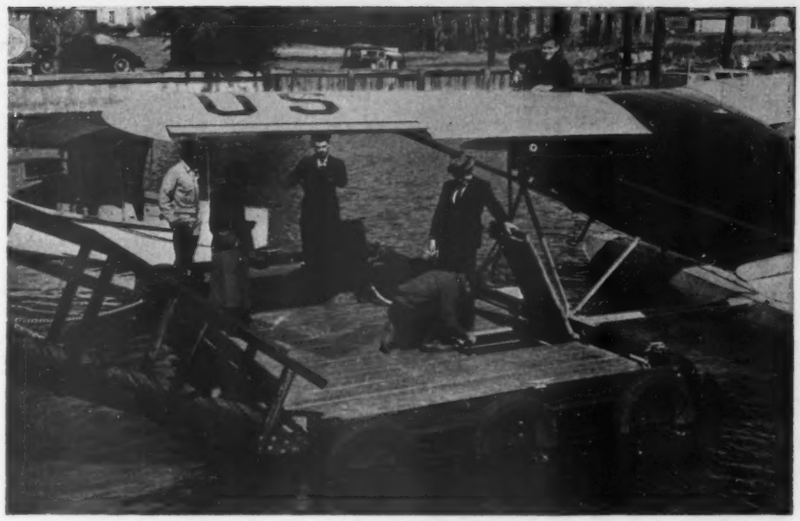
and a way to refuel at specially designed docks where wings will not be damaged against high pilings or other obstructions. In short, the more seaplane bases, the more places there are to visit.

Seaplane operation offers the fixed base operator many advantages. The smart business man goes where the crowds are. No one needs to be told where the crowds are all summer long —when flying business is best. There is hardly a lake or river in America that is not lined with summer resorts. Along many of our coastal areas, especially along the East Coast with its hundreds of miles of inland waterways, people by the thousands swarm in from the large cities. And they all have money in their pockets.

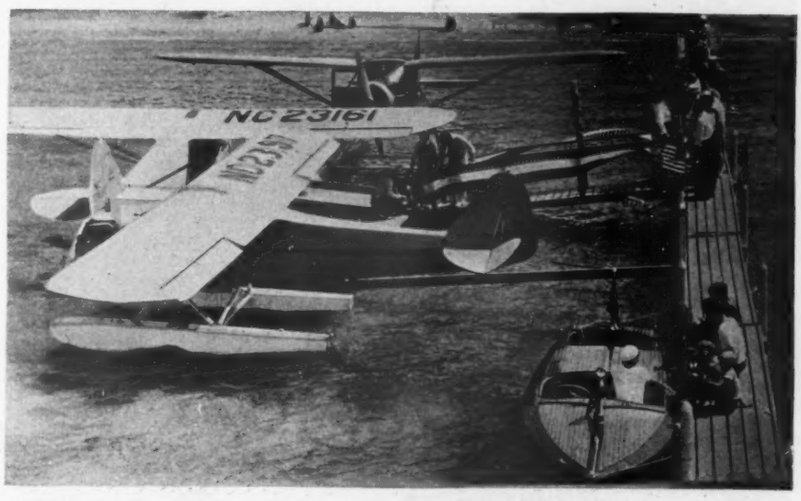
An experienced seaplane operator who has had bases in half-a-dozen kinds of places, with both wheels and floats, summed up his recommendations this way.

"The ideal place for a fixed base operator," he said, "is one where there is a crowd of people. There must be a stable population from whom we'll get students and charter hops, as well as sight-seeing. Then there must be a transient population that will keep giving us a steady source of new customers. I also want my base located so that I'll get as much free advertising as possible—so that the crowds will see us taking off and landing many times a day. When you add these things all together, a seaplane base at a summer resort is the best bet."

Operators who are forced off busy airports by the airlines should consider moving to a water base. Here is a God-given airport which often stretches for miles. Perhaps the CAA



**Refueling Capt. Bob Fogg's CAA Fairchild at Jacksonville. CAA-designed floats have a lift hatch which gives easy access to drums used for flotation purposes.**




**One advantage of seaplane operation is that simple piers and floats are sufficient.**

**Every lake and river where crowds gather is a potential source of seaplane business.**

Dewey Eldred's Taylorcraft on Edo floats over Miami.

has already provided the landing float. For a few hundred dollars a ramp can be built and an ingenious operator can construct a small marine railway and a Boston dolly for hauling his ship from the water. Many seaplanes are left in the water all summer and no hangar is needed.

The country has any number of seaplane operators who bless the day they left a hot dusty airport for the cooling breezes of a lake or river. Out in Seattle there are the Washington Aircraft and Transport organization, and Kurtzer Flying Service, who have good-sized hangars on Lake Union and over fifteen seaplanes between them. Kurtzer has twenty CAA college students in addition to his regular work. Other Washington float operators are the Olympia Air Transport at Olympia, and Hubert & Dillon of Tacoma. In Portland, Ore., Art Whitaker, who is a Cub distributor, has been pushing seaplane flying for some time.

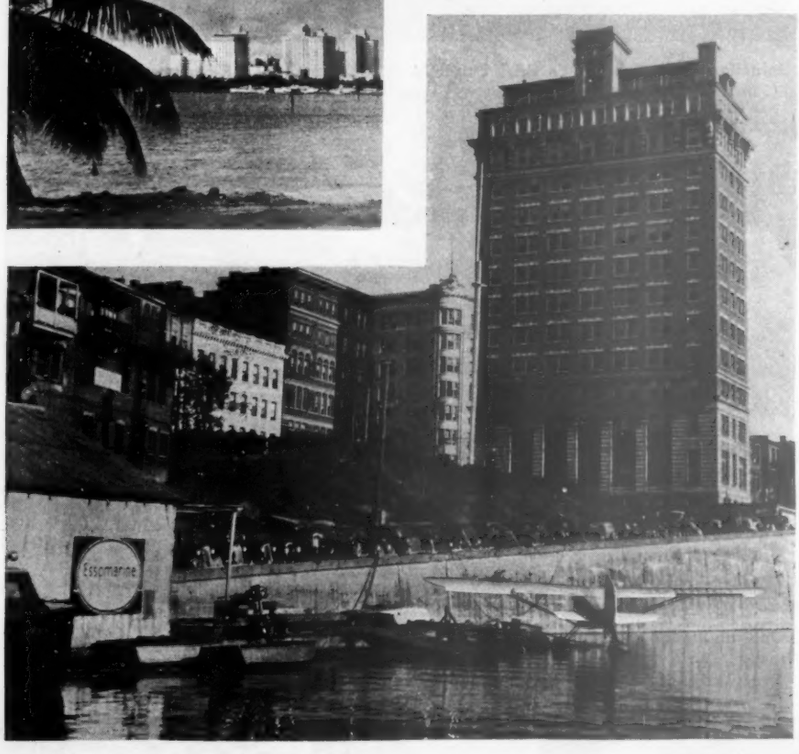
Several operators have found the lake regions of Michigan, Wisconsin and Minnesota are ideal places for summer operations. At Milwaukee, the Lange Aviation Corporation has its base right in the city. Customers can practically step from their offices or homes right on to the base. Lange has Cubs, Luscombes and Fairchilds of his own, and many pilots in that area come to him in the spring to have wheels removed and floats put on their ships.

In Michigan, Irving Woodhams who operates out of the Kalamazoo airport also has a summer base at nearby Austin Lake where he has a ready-made crowd waiting for him. He operates several ships, including a Cessna, on floats. If his customers get tired of fishing at home, he can hop them up to the lakes in the wilds of northern Michigan in a few hours.

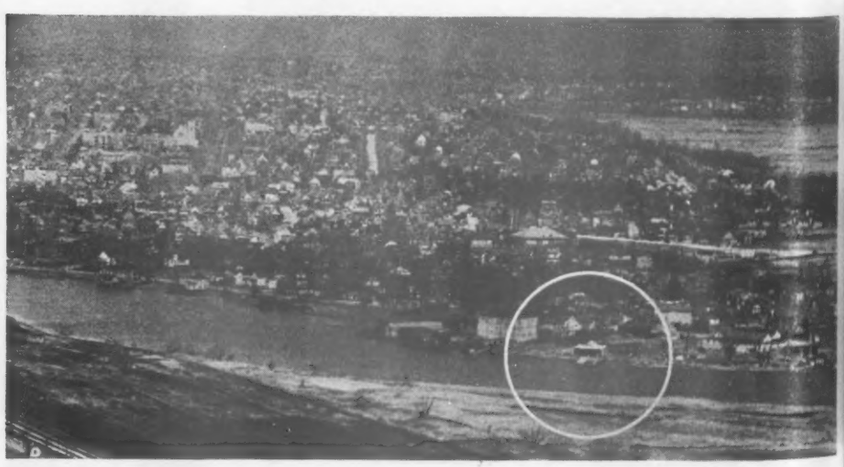
Charles L. Davis of Detroit, operating Seaplane Sales, Inc., does instruction work and hopping with three Cubs. Business is good, he tells us. Michigan has over 40 seaplane bases, due in a large measure to the active work of State Director Floyd Evans.

In Davenport, Iowa, Allied Aircraft Sales has a base on the Mississippi river. The operator there has a dock, a marine railway and a hangar recently constructed. On Medina Lake, some 20 miles out of San Antonio, Texas, a new seaplane base has been

(*Turn to page 94*)



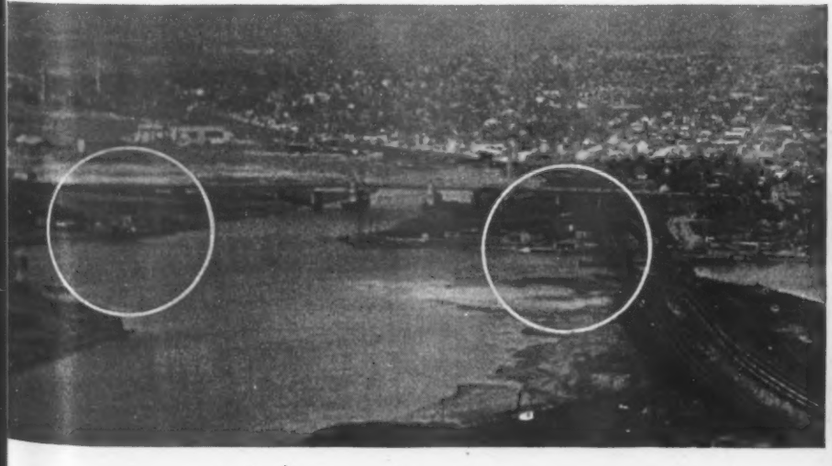

**Glenn Clark has his seaplane base right in the heart of Charleston, W. Va., and pilots who rent his planes have only a few minutes' walk from their homes or offices. Every flight his ships make is an advertisement for his business.**



**Right. Typical of the new interest in seaplane flying in the New York City area are these three bases at Ridgefield Park, N. J. These three operators have more than 200 active students. Many cities have similar water areas that could be used. (Aerial photo by Al. Hummers)**

Hunters and fishermen will rent your seaplanes if you give them a chance.

A Boston dolly being used for one of Bob Love's Stinsons at Boston. CAA will provide complete plans for dollies like this one, as well as designs for floats and ramps.



Top to bottom. 1. A two-wheeled beaching gear used with a Stinson at Seattle. 2. W. P. Ingersoll's marine railway at Crane Lake, Minnesota. 3. Passenger car used for towing at Fox Paw Seaplane Base, Fox Lake, Illinois. 4. An Aeronca on a small 4-wheel handling dolly, Inter City Airline, Boston.

# DON'T GIVE UP THE SHIP!

**To the 10,000 Civilian Pilot Training Students, we say, "Keep flying this summer".**

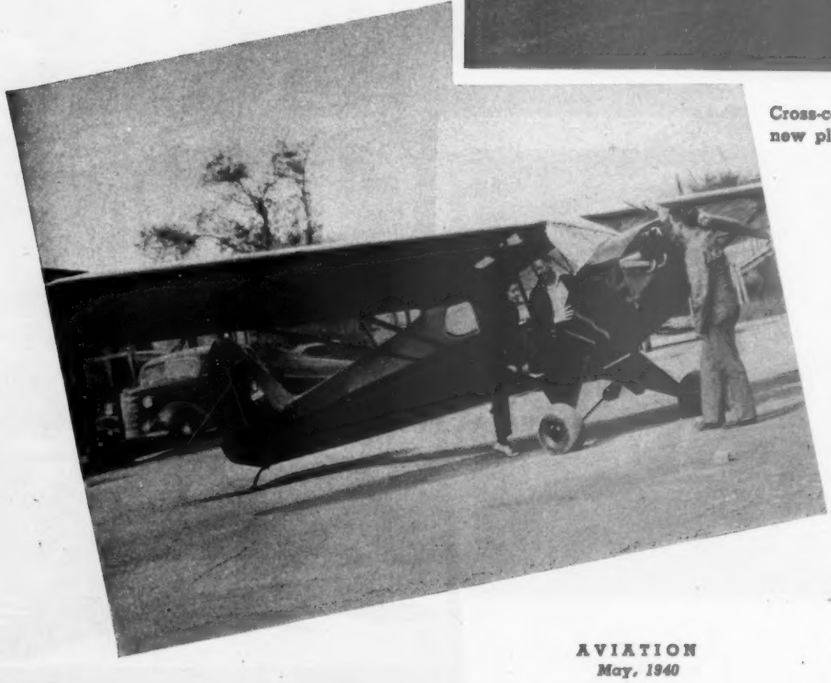
*Photo by Greenhoff*

**Cross-country flying with your friends will bring you new pleasures and aviation experiences this summer.**

LIFE begins at 40 . . . hours! The real fun of flying is about to commence for the 10,000 new Civilian Pilot Training students. With the long, summer days just ahead, you are about to collect profitable flying dividends on your training investment.

There has been plenty of fun in the first 35 or 40 hours. We don't need to tell you that. You still get a kick out of recalling those first eight hours of instruction, and the deep thrill of your first solo. You'll *never* forget that! There was real satisfaction in the rest of your training, too, when step by step, you mastered smooth take-offs and landings, precision turns and when you finally flew with the easy coordination that made you part of the airplane.

That was all fun—sure. But it was nothing compared with the enjoyment you will get out of being on your own. Up to now you've been like a circus horse, running 'round and 'round the ring, going through your paces under the eye of your instructor. That training had to come first, of course. Now you are soon to be on your own and you can do a little galloping across distant pastures. *You'll* be the boss.



Many of you live in the same area where you've been getting your instruction. You will want to buy flying time from your own instructor. If you have a summer job, you can still find plenty of time to fly during the long evenings and on weekends.

About half of you are at college

away from home and if you fly this summer you will need to locate a new operator who rents airplanes. It is to you especially that we say, "Don't get rusty".

After you go home in June you will probably go out to the airport near where you live and perhaps things won't seem quite the same. There may be some strange faces, and you may not know the airport manager or the operators.

But don't let these things stop you from flying. At all airports, strangers quickly become friends. In your love of flying you have a bond that will soon make you one of the crowd. A few flights will make you feel at home on the field.

If the make of airplanes used near your home is different from the kind in which you learned, a few trips around the field with the operator will make you familiar with any differences. Most operators will not charge you dual time for these brief check trips. You may have learned to fly in a tandem ship, for example, and if the ones you will fly in this summer are side-by-side planes, a short time in the air will make you feel at home. CPT instruction is basically sound and you can master differences in various light planes without any trouble.

Of course if you want to fly a larger ship, in the class heavier than the light plane, you will need perhaps five hours of dual time. You will enjoy every minute of it. Flying different kinds of ships is always interesting and is something you should look forward to.

Summer flying, you will find, is a lot more pleasant than winter flying. The weather will be warm and balmy. Fields will be grass covered, and there will be no frozen ruts such as you bounced across last winter, or ponds of water and mud such as you encountered during the spring. The landscape is going to be much more interesting, too.

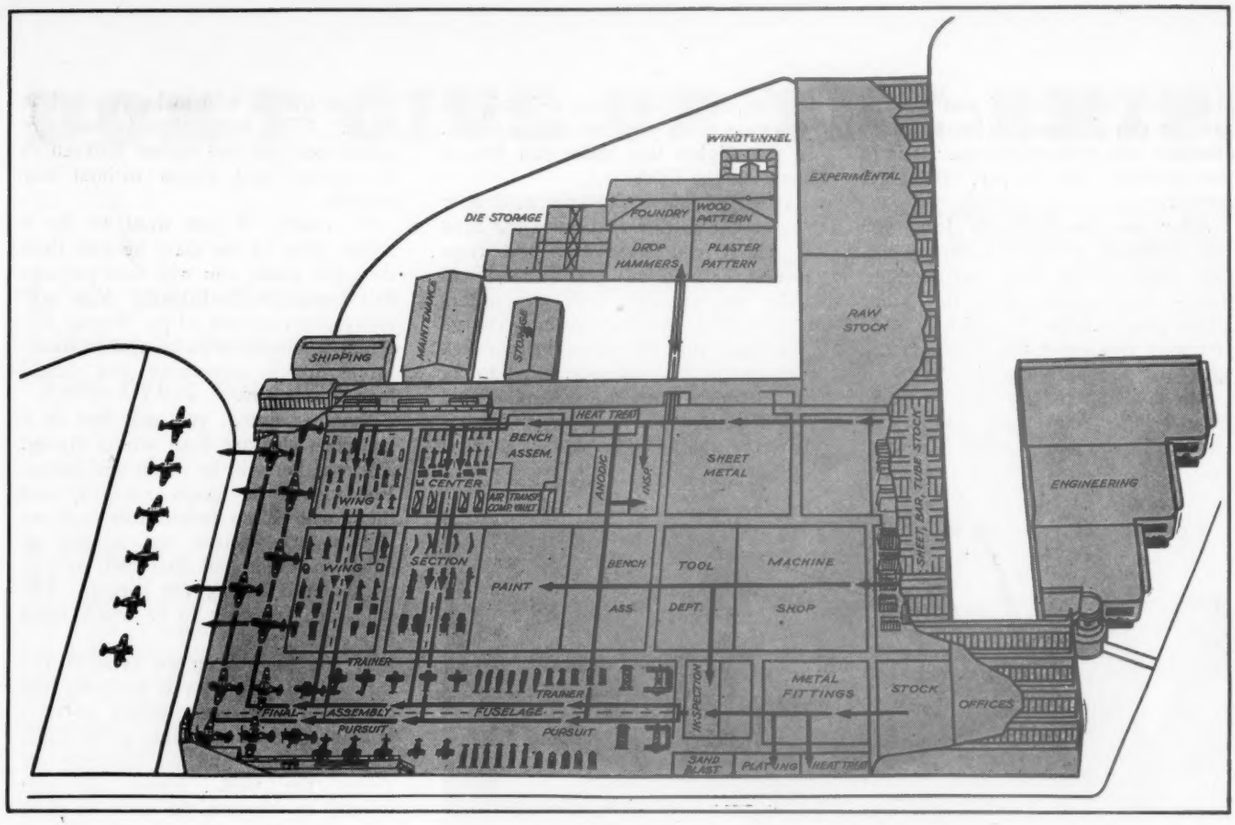
If you have been an aviation fan for several years, as is probably the case, you have spent plenty of time at airports watching other pilots climb into a cockpit and go zooming off across the field. Above all men around an airport, the pilot is most admired. This summer the crowds lining the field will be watching you as the center of attention.

One of the big thrills this summer

(*Turn to page 107*)

**The country is filled with pleasant places for you to visit on your summer flights.**

*Photo by Groenhoff*




# STREAMLINED AIRCRAFT PRODUCTION

**By**
**Don I. Carroll**
*Vice-President and plant manager, Vultee Aircraft, Inc.*

**As told to**
**Chas. F. McReynolds**
*Pacific Coast Editor, Aviation.*

MORE PLANES and more profit per square foot of floor space has been the aim of the Vultee Aircraft Company in the construction of its new factory. A special set of circumstances, combined with remarkable teamwork on the part of all the men who have worked to make this possible, has enabled us to realize the dream of all production men—the ideal factory for a given production problem—or at least as nearly ideal as anything planned and built by human beings may ever be expected to prove itself. For we have been able to design simultaneously a whole series of Vultee airplanes, the factory in which to build them, and the equipment with which to do the work. For some months now we have applied every facility at our command to the proper solution of this three-fold problem. The aircraft themselves—the Vultee basic and advanced trainers, basic combats, and pursuits—were planned to take advantage of every known production tool. At the same time the factory was laid out to provide for an expansion program which has increased our total floor space from 150,000 sq. ft. to more than 335,000 sq. ft. Those square feet of floor space were so planned as to eliminate every possible obstruction to smooth production. We sought to streamline the production line through eliminating lost motion or idle time of parts in process. And we tried to equip the factory with the latest and best machinery that we could build or buy. More than $650,000 has gone into the purchase of new machinery and equipment with which to build the millions of dollars worth of planes already on order.

Every phase of factory planning, every type of production problem, was considered from every possible angle during our planning period. As a result we believe that parts flowing through our plant are moving from 25 to 50 per cent less distance from raw stock to finished plane than in the average aircraft plant. But we have worked to eliminate other production losses also. Aware that a study has shown 70 to 85 per cent of all manufacturing time to be consumed in set-up, loading, and transporting operations, and only 15 to 30 per cent in actual cutting or forming, we have taken some drastic steps to reduce

**Don Carroll, left, discusses production with Vultee President Richard Millar.**

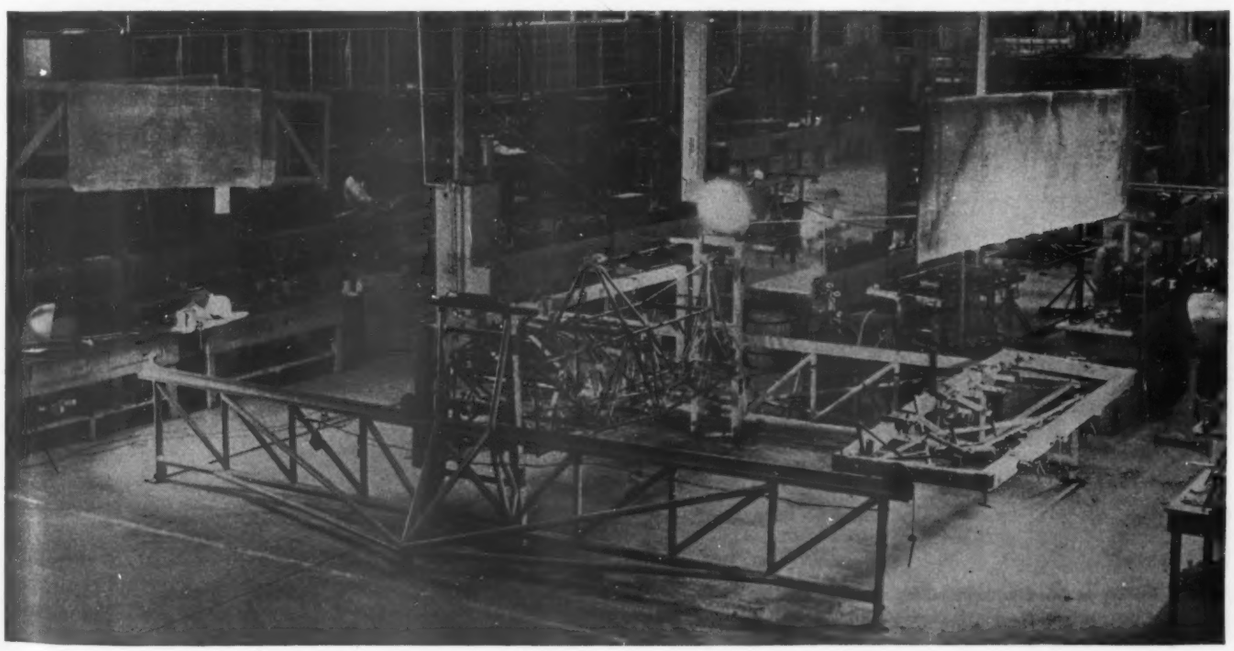
**Above. Final assembly hangar showing completed ships outside.**

**Below. Fuselage production jig permits many men to weld and assemble steel tubing.**

time spent in operations other than actual work. And then we have gone on and found ways to reduce work time by as much as 90 per cent, in some cases.

We have also taken great care so to plan and equip our plant that the need for specially trained personnel is kept at a minimum, and all personnel is given opportunity to reach full efficiency through having proper tools, adequate working space, full accessibility to work, etc. Further, we have streamlined the tooling process so that the skilled worker does not lose time from his work obtaining tools for his next work set-up. Instead we have a system of tool planning boards and tool runners. The operator posts on his planning board the list of tools to be needed for his next set-up. A tool runner services him by studying the board, drawing the needed tools, and placing them on his work bench ready for immediate use. The same tool runner returns the tools from the previous set-up at the time of the change-over.

But to give you a picture of what we have done, let me describe the plant layout, and take the reader through a quick tour of the various departments. The engineering department and executive offices are located at the front of the plant and partially separated from the main factory building by an alleyway which gives access to the stock rooms. Raw stock is stored all across the front of the main building, into which it is fed from the alleyway just mentioned. Great care



has been taken to develop improved methods of handling and storing our raw materials. For example, sheet alloy is kept in racks mounted on casters, making any grade or gauge sheet material as readily available as a card in a filing cabinet. The store keeper simply pulls out the rack and removes the required number of sheets of metal. An overhead handling system is installed in the stock rooms for moving heavy or cumbersome materials.

An aisle separates the stock rooms from the metal fittings, machine shop and sheet metal fabricating departments, and in order to keep the movement of materials to an absolute minimum each fabricating department is located just opposite the section of the stock rooms which feeds it material. Steel stock is located at the left end of the stock rooms and feeds directly out to the metal fittings department.

Bar stock, tube stock, etc. is located approximately in the center of the stock rooms and is fed out to the machine shop just across the aisle. Sheet stock is stored to the right and fed out to the sheet metal department, located on the right side of the factory. When parts from the fabricating departments are completed and ready to go on to the next operation they pass through inspection and so as to obviate the necessity of back-tracking to a centralized inspection department, separate inspection units are located directly in the path of the production flow. The sheet metal inspection unit is located at the far end of the sheet metal department, and one located at the end of metal fittings takes care of parts from this department and from the machine shop.

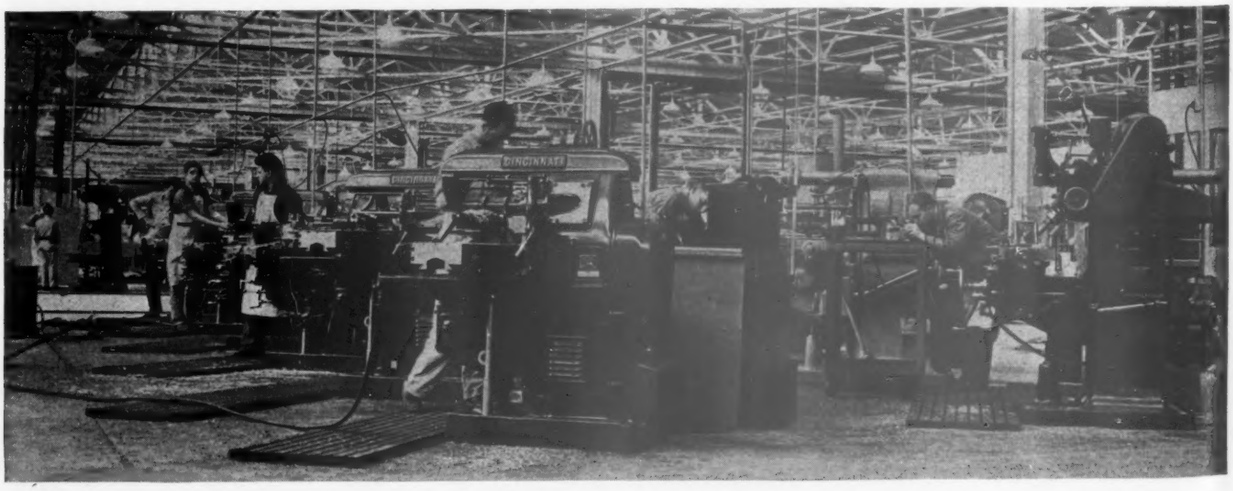
We have planned the plant in such a way as to eliminate insofar as possible the storage of formed parts and sub-assemblies. As each part or assembly is completed, it moves on to take its position in the assembly line. Parts taken from the three fabricating departments, after passing through heat treat, anodizing, sand blast, etc., begin to flow together in assembly operations.

Adjacent to and just beyond sheet metal, and the machine shop, is located the bench assembly department, from which parts flow on through the paint shop and into the wing, center section, or empennage assembly lines. The fuselage sub-assemblies begin to take shape to the left of bench assembly and as soon as the fuselage is removed from its master jig it takes its place at the beginning of the assembly line. At the present time two assembly lines are set up along the left side of the factory, one for the Vanguard pursuit and the other for the Valiant basic trainer type. The assembly line fuselage jigs are mounted on casters and move towards final assembly on a track. This keeps the production line flexible, and in the event we wish to move one airplane ahead of another or pull it out of the line for any reason, it can be done instantly.

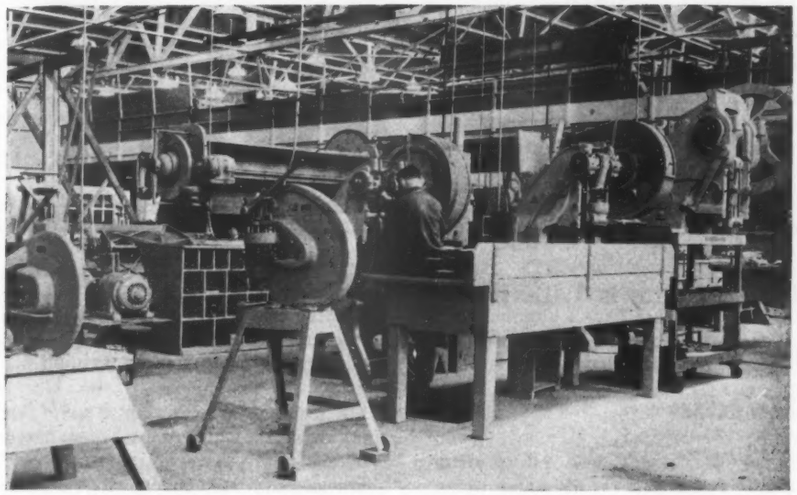
The wing, center section, and empennage assembly lines located beyond the paint shop flow across the factory and into the final assembly line. Production is carefully scheduled so that these assemblies meet the line at just the right time. The power plant assembly line is located under the balcony on the left side of the factory. Fastened to the uprights which support the balcony is a track upon which steel plates, corresponding to the air-

**Vultee engineers designed and built this high speed mill, which runs to 10,000 R.P.M. A job that used to require 30 hours is done in two hours on this mill, using specially designed cutters.**

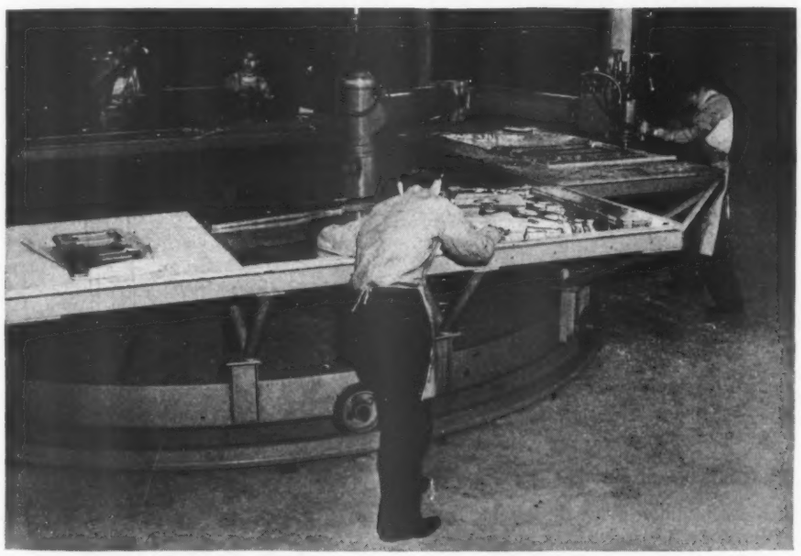
**One man using this Erco automatic riveter can turn out twice as much work as he could formerly do with older methods.**




**Vultee factory is filled with latest type of machine tools which help to speed up production. Much of the $650,000 which was spent on new production equipment was invested in new types of lathes, mills, screw machines and other such equipment purchased from Cincinnati, Milwaukee, Van Norman, Cleveland and other machine tool manufacturers.**



**The trend to increased use of machines by aircraft plants is typified in this Vultee shop where brakes, shears, punches and other sheetmetal machinery is used.**



**Router work is speeded up as much as 250 per cent by this rotary router table which permits set-up and unloading without interrupting the router operator.**

plane firewall, are mounted on rollers. In production, an engine is bolted to one of these plates and all fittings up to the firewall are assembled on the engine as it moves down the track.

An overhead handling system moves the completed engine installations from the engine assembly line over to the airplane production lines. The airplanes on the basic trainer and pursuit production lines face each other, and the overhead handling system for the power plants brings the required engines down the center of the two lines, where they are swung into position and readily mounted on the airplane to which they are assigned. The final assembly and service hangar runs across the rear of the factory and has a clear 35 foot ceiling. Separate from the main factory building are the storage, shipping, maintenance, and drop hammer departments. In the drop hammer building are concentrated the foundry, wood and plaster pattern shops, and the hammer shop itself. Hammers vary in size from a small one accommodating dies as small as 50 lbs. in weight to a huge hammer using dies weighing up to 12,000 lbs. By separating the drop hammer shops from the factory proper the noise and jar of this work is kept away from the main production lines.

Next to the drop hammer shop is the Vultee wind tunnel, one of the first independent wind tunnels to be erected by any aircraft company on the West Coast. And at the far front corner of the main building, beyond the raw stock receiving rooms, is the experimental department. Here we have provided laboratory equipment for every form of testing up to and including stressing a full scale wing to complete destruction.

But to return to the production line itself, we have installed many interesting pieces of equipment. Not the least of such installations is our own completely equipped machine shop with batteries of Cleveland, Milwaukee, Van Norman, and other well known lathes, milling machines, screw machines, etc. Of great interest are the items of equipment which we have designed ourselves, or have had built to our specifications. Before sheet metal can be fed from raw stock to the sheet metal forming department it must be cut to pattern. For this work we have developed a radial router set-up with a rotary work table. We have increased production of this router as much as two hundred and fifty per cent through use of the rotary table, or "merry-go-round" with four set-up positions. This arrangement permits loading one position while the operator is routing and while still another workman is unloading a profiled stack of material. Thus an endless number of fully set-up work tables is fed past the router operator and he can concentrate all of his attention upon the operation of his machine. Provision is made for locking the turntable solidly in place while the router is working.

Not fifteen feet away from the routers are the power brakes and our new three column hydraulic press with motorized rotary platform and automatic cycle operation. This loading platform has three positions, one for loading, one for pressing, and one for unloading. Two operators are required, one to load and one to unload. Actual pressing operation is fully automatic and the element of hazard for the operator is entirely eliminated. The pressing head travels approximately two and a half times faster than any hydraulic press previously used for aircraft work. As the head rises after the pressing operation the rotary table automatically swings around to bring the next set of loaded dies into position for pressing.

Another unique machine, which represents an adaptation of wood working procedure, is the new Vultee high-speed milling machine developed

(*Turn to page 98*)

# For a Ripe Old Age—
# FOLLOW THE

**Private flying under a controlled program is 1,100 per cent safer than it was throughout the entire country last year.**

**By Tom Hardin**
*Chairman, Air Safety Board*
*Civil Aeronautics Authority*

"THESE are not accidents. They are suicides!"—This blunt remark was made by a friend of mine after he had finished reading some recent airplane accident reports. The grim charge was not fair to the pilots because none took his own life or his passenger's life intentionally. But when one reads the cold, unadorned facts of an accident report he realizes that in most fatal accidents the pilot's complete disregard of flying rules is as deliberate as though he intended to destroy himself and his airplane.

The pilot failed to control his flying—to confine it within the limits of his training, experience and the dictates of good judgment.

Private flying cannot progress until the safety record is better. Thousands of potential pilots are kept away from flying because they are afraid of accidents. To a non-pilot, flying is somewhat mysterious, and what is unknown is often a little frightening. Given this feeling to begin with, it may take only one accident seen or heard about to drive the embryo pilot away from flying for a long time.

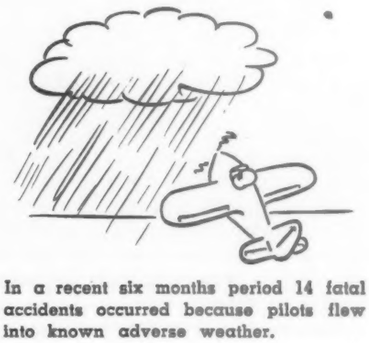
The great toll of private flying accidents is not necessary. A high-accident rate in any kind of flying can be improved, as the airlines have demonstrated conclusively. By a joint industry-government program, the airline record has improved year by year until the domestic airlines have now flown for more than a year without a single fatal accident in the entire United States. During the twelve months ending March 26, 1940, the domestic airlines flew over 87,000,000 miles without a fatality. Yet during 1939, private flying had 189 fatal accidents in 182,000,000 miles—a fatality for every 963,000 miles flown. Discouraging as this figure is, it is an improvement over 1938 when there was a fatality for every 752,088 miles of private flying.

*Improvement in private flying can be made.* A high accident rate is no more inevitable in private flying than in airline flying. The CAA Civilian Pilot Training program furnishes the proof. More than 100,000 hours, or approximately 7,000,000 miles were flown in this program before the first fatality occurred. Up to April 1, CPT students flew about 122,000,00 miles per fatality, which is more than 1,100 per cent better than the entire private flying record for last year. The records of some of our best commercial flying schools and charter operators furnish additional proof that private flying can be safe.

### Controlled vs. Uncontrolled Flying

Fatal accidents usually come from uncontrolled flying. The pilot either lacked individual control or discipline, or his instructor's influence did not reach out to restrain or direct the pilot. A few examples of uncontrolled flying are emphasized in recent accident reports.

During the six months ending March 1, the Air Safety Board reported fourteen fatal accidents caused by pilots starting or continuing flight into known adverse weather conditions without the equipment or training necessary for instrument flying. During the same period there were 45 fatal accidents reported that were caused by the pilot engaging in some sort of unnecessary maneuver close to the ground, or other brand of airmanship that might be classified as show-off or reckless flying.



**In a recent six months period 14 fatal accidents occurred because pilots flew into known adverse weather.**

Regularly we investigate accidents in which pilots met with disaster because they forgot to fill the gasoline tank or attempted to stretch their supply over too great a distance. During the last six months an average of one fatal accident a month has been attributed to this type of negligence.

A certain number of young men foolishly believe they are natural-born pilots and that they can fly without instruction. There are about half a dozen recent cases in which individuals with little or no recorded flying time brought death to themselves during their first, self-initiated attempt to fly without an instructor in the plane. In one instance, such a pilot had the audacity to attempt to test a new type of airplane. These incidents do not include the numerous cases in which meagerly trained pilots attempted to overstep their ability and brought injury not only to themselves but also to their unsuspecting passengers.

**Forty-five pilots were killed in six months doing show-off flying.**

# FLYING RULES

Other accidents exhibiting the same general lack of judgment occurred as the result of pilots diving their planes until the wings cracked under the strain, or because they attempted to fly in some other manner inconsistent with the design characteristics of their equipment, existing conditions or pilot qualifications.

Whether or not these accidents involved show-off or reckless flying inspired by over-exuberance, or were just cases of negligence, carelessness or poor judgment, they all occurred due to lack of control. Pilots failed to discipline themselves and to exercise good judgment.

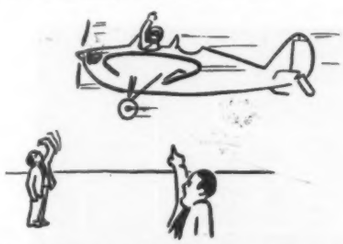
In *controlled* flying, on the other hand, as is exemplified by the teaching at our better flying schools and in the Civilian Pilot Training program, the instruction is so excellent that the student knows how to fly properly and he has a deeply ingrained sense of self-discipline. Teaching follows a pre-determined pattern in which nothing is overlooked or forgotten. Students are so prepared for emergencies that when one occurs they automatically do the right thing.

The most important step toward the eradication of suicidal flying and development of controlled flying in its

**One pilot a month is killed because he forgets to fill his gas tank.**

stead is the early indoctrination of air discipline in the mind of the student flyer. This is a job for the instructor. Every instructor should be the idol of his students. He should guard his qualifications, character, and conduct with professional pride. They should be unimpeachable. The instruction and philosophy that he can impart to the student during early training days usually form the student's guiding light throughout the rest of his flying career. The instructor recertification program as recommended by the Air Safety Board and started last year should do much toward assuring us that all instructors will be more capable in handling this great responsibility.

The splendid safety record of the airlines has been mentioned. Airline operations are conducted by large organizations in which controlled flying is relatively easy to obtain as compared with improving private flying which is scattered over 2,500 airports and pasture fields throughout the country. Control in this latter type of flying is an individual matter, as the pilot is usually on his own.



**Pilots who try to learn flying without an instructor usually become an "accident statistic".**

But much can be done to cure a reckless pilot of his fool-hardy ways by group censorship. The cool reception of such an individual by fellow pilots will discourage his show-off tendencies and the creation of a public opinion that will deprecate the acts of the show-off will cut at the very basis for his conduct.

Other means of controlling the situation might be through local ordinances or state laws enforced by local authority; severe airport rules restricting operations of show-off pilots, and agreements between aircraft owners not to rent equipment to such pilots. Aeronautical organizations such as local N.A.A. chapters, flying clubs and aviation committees of local service clubs can greatly assist in promoting one or more of the foregoing safety control measures. These suggestions are not made with a view to increasing federal regulations, but rather as a means of providing practical enforcement of safety measures

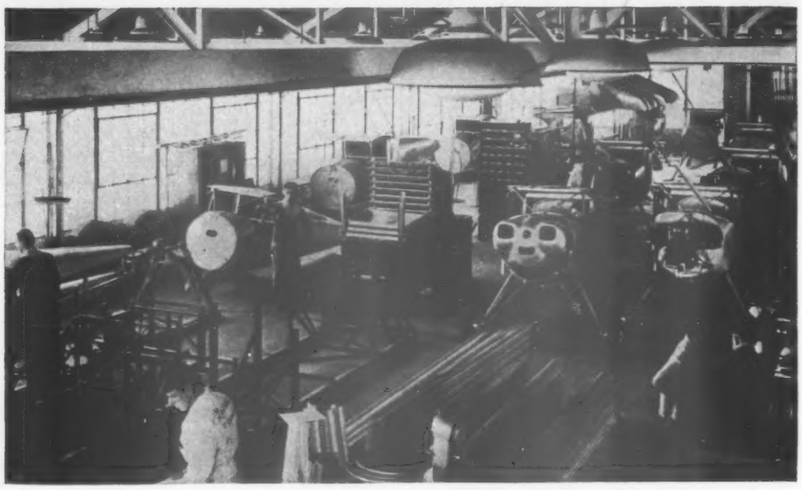
**Diving a plane until the wings crack off is a sure form of suicide.**

now covered by federal rules. Reference is made particularly to the restraint of pilots by local laws when pilots attempt to fly into known adverse weather conditions or desire to operate craft improperly serviced or maintained. We *may* need more federal regulations, but violations of existing regulations are clearly indicated in about 50 per cent of all fatal aircraft accidents.

Strict enforcement of regulations is not possible without individual and group cooperation from the aviation fraternity itself. An unreported violator cannot be prosecuted, neither can a dead one. It is not practical from an economic standpoint—nor desirable if it were possible—to place a federal police force on every one of nearly 2,500 airports throughout the country. Consequently, if we are going to have enforcement of safety regulations, it will have to come from the flying industry and each person within the industry, possibly assisted by local civil authorities.

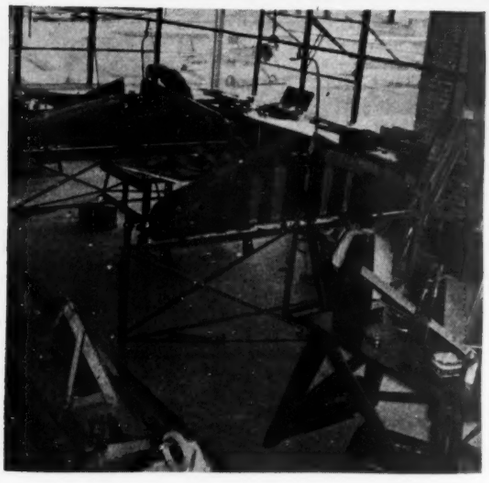
Improving the safety record in private flying depends upon three factors: providing better basic training, controlling the reckless, show-off flyer, and in doing everything possible to provide a spin-proof and stall-safe airplane. This last development introduces a problem we have to solve with the assistance of aircraft designers and manufacturers. Past records indicate that if every airplane flying today could be made spin-proof and stall-proof, the number of fatal accidents would be cut in half, if not more than half.

(*Turn to page 110*)



Fuselage is begun in jigs on left and is then moved on monorails until landing gears are installed, at rear of this shop. Assembly line then moves forward as shown at right.

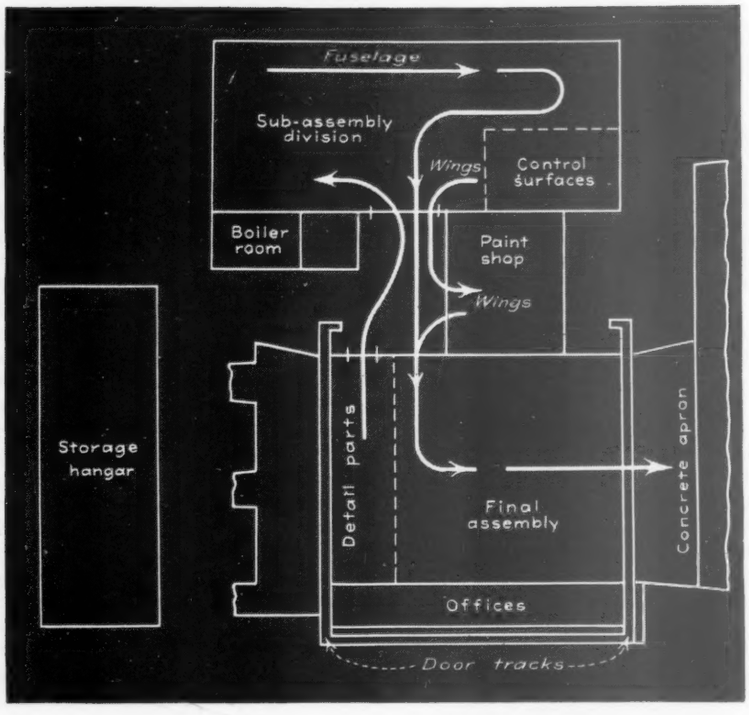
All-metal stabilizers are assembled part by part on the two jigs shown here. Rivet holes are predrilled.



# How Luscombe B


**By Charles E. Burgess**

*Production Manager*
*Luscombe Airplane Corporation*


BUILDING light airplanes of metal construction brings many production problems which are not met in the factory where typical light planes are manufactured. Beginning with the Phantom, Luscombe engineers have had experience over several years with metal construction methods. The Phantom, however, was a hand-made airplane whereas the Luscombes rolling out of our factory doors today are produced as efficiently as possible and with a minimum of hand work. In our 24,000 square feet of floor space, new production methods now permit us to turn out four metal ships per day.

The present Luscombe has a full monocoque fuselage of 17ST Alclad skins, .032 and .040 thick, riveted to oval-shaped Dural bulkhead stampings. Wing spars are I-beam Dural extrusions, wing rib cap strips are T shape Dural extrusions. Wings are fabric covered. Tail surfaces and control areas are of channel section Dural covered with Alclad.

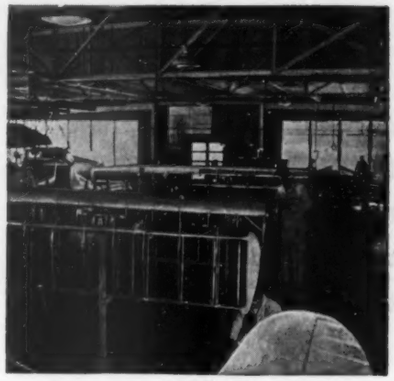
In order to produce an airplane of

Ships moving forward on assembly line, after undercarriage has been added. Stabilizers, fins, engine mounts, engines, wind shields, panel boards, and many other cabin fittings are added here before final assembly starts.

After stabilizer is assembled to fuselage, the vertical fin is made secure. Note convenient hand hole at right.

Mechanic on left is using a bent dolly to buck rivets on stabilizer, which is removed from jig for final riveting.

Wood jigs make wing assembly an easy matter. First jig has a right-hand wing, second has a left-hand wing.



# Builds Metal Planes

these more expensive materials, to sell in the low price class, it has been necessary to reduce the work done outside the factory as much as possible as well as keep detailed hand labor to a minimum within the plant. Progress towards this end has been most noticeable within the last year. Various jigs have been developed to enable the rapid assembly of detailed parts. For the most part these jigs are simple and are of wood or steel. Formerly all fuselage covering skins were drilled by hand after being fitted to the bulkheads in the fuselage jigs. This job, using predrilled skins as at present, has resulted in cutting production time almost in half.

The entire procedure of production is based upon the fast assembly of prebuilt parts to the airplane as it goes through the line on an overhead conveyor. Stamped bulkheads, obtained from Teicher Manufacturing Corporation, are predrilled in template forms in the sheet metal division, painted with P27 primer, and placed on a huge supply rack at the head of the assembly line. Small aluminum forgings, reinforcements, and fittings are riveted to the bulkheads to which wing struts and landing gear are attached. This riveting is done with Chicago Pneumatic jaw riveters prior to arrangement of these bulkheads in the fuselage jigs. Firewalls are of stainless steel, shotwelded by the Edward G. Budd Company. Three suspension points are built into the firewall for the engine mount, and a vee shaped welded steel tube structure joins the top suspension point to the superstructure at either side. The superstructure is of 17ST Alclad sheet with an oval Pyralin window built into the center of it. Deep extruded channel sections of Dural, joining the wing butts, are riveted to the lower front and rear of the superstructure. Longitudinal L shaped extrusions on top on either side of the skylight provide further reinforcement for the superstructure.

The above mentioned parts, in addition to many others, are made up in quantities and stacked in the subassembly division of the plant. Large sheets of Alclad come into the Luscombe plant flat. These are cut on a Niagara shear in the required sizes. They are then assigned to their respective jigs where the are drilled. After this procedure they are curved to the desired degree on a rolling machine and stacked at the head of the fuselage assembly line. Once bulkheads and firewall are set up in the fuselage jigs, two of which are now in use, the predrilled skins are clipped to the bulkheads by Cleco spring fasteners. Rivets are inserted, covered by masking tape, and the main structure is then riveted together by four men in 3 hours and 40 minutes. The fuselage is then attached to an overhead conveyor and routed to the next production stage where the seat bottom is riveted in place and the landing gear legs are placed into position.

This landing gear is a unique arrangement and employs only a single oleo unit located within the fuselage at the center. The external landing gear leg is bolted into the sleeve of the lower part of the internal leg. The main landing gear leg is therefore two individual parts bolted together, the upper part of which will usually withstand the most severe damage to an airplane. This construction requires only that the lower leg be replaced in most cases involving landing gear damage. The landing gear is a heat-

(*Turn to page 102*)

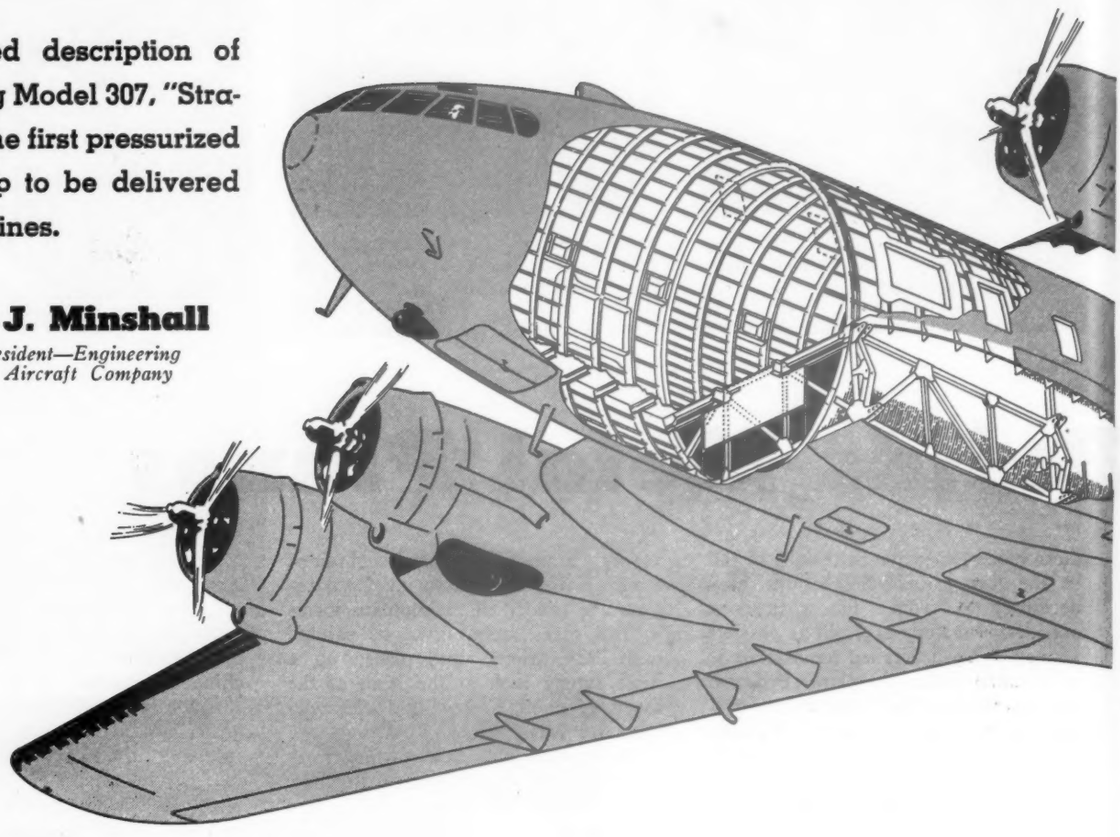
Above, Corrugations in ailerons are made in this press brake replacing hand method.

Right, Until brake was installed, slower hand method was used to form aileron corrugations.

Ailerons are assembled on jigs like this. Temporary fasteners hold sheets to frame during riveting.

**A detailed description of the Boeing Model 307, "Strato-liner" the first pressurized cabin ship to be delivered to the airlines.**

**By R. J. Minshall**
*Vice-President—Engineering*
*Boeing Aircraft Company*



# Into the SUB-STRATOSPHERE

TO say that the aviation industry is making a marked advance this year with the introduction of the four-engine Stratoliner type transport is not the whole story. It should also be stated in another way: The aviation industry has advanced *to* the Stratoliner. The whole background of knowledge and progress through the years—not only on the part of the airplane manufacturer but also the equipment and materials manufacturers, the air lines and allied industries—has made possible this new type transport. From results obtained, we sincerely believe that the Stratoliners and subsequent airplanes of the same general type will have a lasting plaee in the future of air transportation. The principles involved are sound.

When the idea of such a transport was conceived several years ago, it was based on several factors. It seemed apparent that the air transport industry would soon be ready for larger planes than the types then in operation. It seemed clear also that the larger planes would have certain advantages in addition to greater carrying capacity. The larger ship, by virtue of its size, would be more comfortable and more attractive to passengers because of additional conveniences offered. Along with this came the consideration of four engines. The Boeing Company was convinced of the desirability of four engines for such an airplane because of the outstanding success of its four-engine Army Flying Fortresses, and because of the demonstrated advantages of four-engine Flying Boats in trans-oceanic operation. The ability of an airplane to continue flight if one or even two of its power plants should fail appeared definitely attractive.

Then came the consideration of cabin supercharging—something entirely new. Sooner or later air transportation was going to get away from the conventional altitude limitations, and get away from the discomforts which admittedly were present when, for one reason or another, it was found desirable to climb above a certain conventional level. Should the projected Model 307 four-engine transport be the first to attack this problem? There was considerable discussion of the point. There was no doubt that it would be possible and practicable, but there would also be a good deal of expense involved, because

it was a new field. The advantages of the supercharged cabin were so attractive that it was decided at the outset to make this a feature of the 307, and thereafter the name Boeing Stratoliner was created.

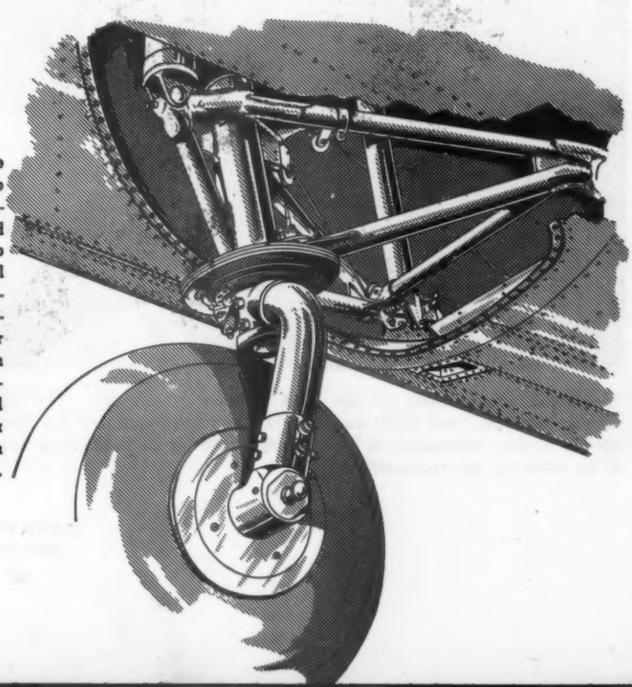
It was decided to use only a moderate degree of supercharging, because this simplified the process and at the same time brought within comfortable reach altitudes as high as would normally be desired for the first few years at least—up to 20,000 feet. In the range between 14,000 and 20,000 feet operators could over-ride most surface weather conditions, would have a wide margin of altitude over high terrain, and at the same time would gain higher speeds, smoother air, and steadier winds.

To gain this end required supercharging of approximately 2½ pounds per square inch (differential between outside and inside atmospheric pressure). The structure was designed to withstand supercharging of 6 pounds per square inch.

In developing the supercharging system and its equipment, and, for that matter, the mechanics of the whole airplane, simplicity and reliability were made the guiding principles. Thus the supercharging and pressure-regulating apparatus was made entirely automatic, with a system of control valves, check valves, safety valves, etc., all operating automatically, purely by action of the pressures involved. This leaves the operator merely the task of turning the apparatus on or off, and watching the few simple instruments that record the operation. It is possible, however, to control the equipment manually so as to continue operation in case of any malfunctioning of parts of the system. As an additional precaution, the system has been installed completely in duplicate. Either one of the two sets of apparatus can do the entire supercharging work.

The principle of practical simplicity likewise was carried out in the design of the supercharged cabin itself. It was made completely circular in cross-section from nose to tail, so that all atmospheric pressure loads are evenly distributed. This design has the additional advantage of providing excellent streamlining, and also provides a maximum cabin volume which is highly desirable for passenger accommodations.

The fuselage is a semi-monocoque structure, consisting of 24ST Alclad covering stiffened by 24 ST extruded bulb angle longitudinal stiffeners and 24ST formed "J" section circumferential stiffeners. The circular fuselage skin is uninterrupted at the juncture of the wings. Skin thickness varies from .020 to .040, depending on loca-



**The tail gear of the Stratoliner is of the single strut oleo-pneumatic type and is retractable into the fuselage. Tail wheel is full-swiveling and provided with a center lock controlled from the cockpit. Retraction is accomplished by means of a screw mechanism and electric motor.**

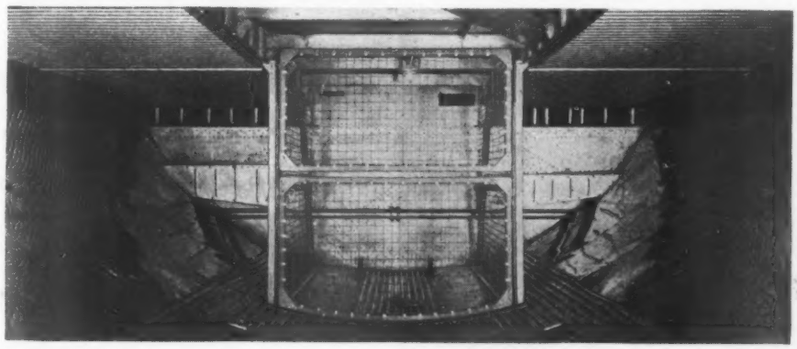
**A Boeing 307-B above the clouds. The ship is powered with four 1100 H.P. Wright Cyclones. Interiors designed for TWA have nine single reclining chairs on left side of cabin, and on right of aisle are four compartments seating six each in daytime, which make up into four berths each at night. Interesting design features are wing tip slots and slotted flaps. Wing span is 107 feet, substantially the same as a B-17.**

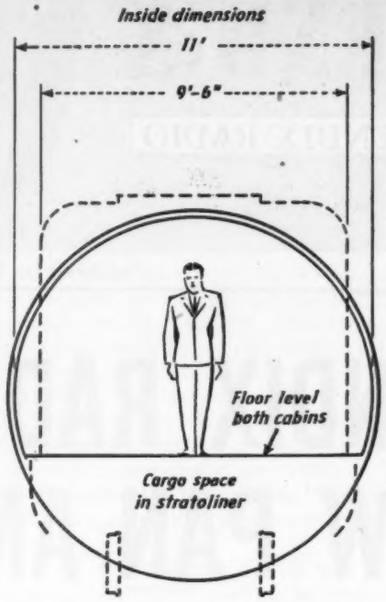
**Inside the control room of the TWA version of the 307. The pilot is on the left, co-pilot on right, and flight engineer in the foreground. In the Pan American cockpit of this model, arrangements have been made for an additional seat behind the pilot to be filled by the radio officer.**

tion. Longitudinal stiffeners are spaced nine degrees apart around the periphery of the fuselage, and run continuous through the circumferential frames, which are notched. Circumferential stiffeners are spaced approximately 16 inches apart along the body centerline.

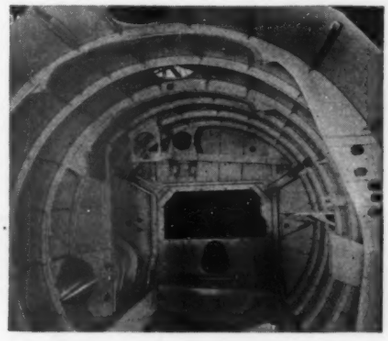
Loads from the wings, empennage and tail gear are distributed to the semi-monocoque body structure by trussed bulkheads. The main wing spar bulkheads are made up of hat section channels and square tube truss members. Part of the longitudinal stiffeners run continuous through the bulkhead hat section channels, while others are bolted to angle fittings. The passenger cabin floor is supported by a system of fore and aft and spanwise beams. The fore and aft beams are built-up "I" sections made from 24ST extruded tee and 24ST Alclad sheet stiffeners with 24 ST extruded rail and bulb angle stiffeners. The spanwise beams are 24ST extruded "I" and "Z" sections and are rigidly attached to the circumferential stiff-

Large cabin volume is illustrated here. Semi-monocoupe type of construction can be seen, and the extensive system of cross beams on which plywood flooring rests. Below is rear cargo compartment, with a volume of 200 cubic feet and load capacity of 3200 pounds. Ship's maximum cargo is 6590 pounds.






Comparison of the cross-section of the Boeing Stratoliner with that of a typical streamlined train.



Interior of inboard engine nacelle prior to equipment installation. Semi-monocoupe structure is similar to that used in Boeing 314 Pan American Clippers.

eners at the sides of the body and to the fore and aft beams.

Demarking the rearmost end of the supercharged cabin is a hemispherical pressure bulkhead, consisting of a dome-shaped web of 24ST Alclad sheet with radial "J" section stiffeners. A removable circular hatch is installed in one side of this bulkhead to provide access to the tail section of the body. This bulkhead also contains a pressure relief valve which is set to discharge any pressure in the cabin in excess of 2.65 lbs. per square inch. This safety valve has a capacity to handle the full overload output of both cabin superchargers, to prevent excessive pressures in case of the remote possibility that all other controls should fail. The normal function of the automatic controls, of course, is to prevent pressures in excess of 2½ lbs.

The maximum diameter of the fuselage is 11½ feet. The floor level is located approximately one-third of the diameter from the bottom of the fuselage at its largest section. Cargo compartments and accessory compartment below the floor (all of which are accessible from within the airplane as well as through outside hatches in the bottom) are maintained under full cabin pressure. Cargo compartments have a combined capacity of 412 cubic feet, or 6590 pounds. An auxiliary entrance to the control cabin is provided through the bottom of the body forward of the front cargo hold, by way of a trap door in the cabin floor, and operating personnel may thus enter the control cabin without passing through the main passenger cabin.

Skin seams in the fuselage are sealed effectively by means of a tape impregnated with sealing compound, inserted between the laps prior to riveting. The seams include two rows of rivets diagonally spaced approximately ⅝ inches apart. All doors and hatches are sealed against leakage simply by soft rubber gaskets which press together when under the influence of cabin pressure. There are seventeen main passenger compartment windows each measuring 16 inches high and 12 inches wide. Like the rest of the cabin wall, they are designed to withstand 6 lbs. per square inch internal pressure. The windows are made of Plexiglas or Lucite (transparent plastics), curved to conform with body contour, and are sealed in rubber channels. Control cabin windshield and sliding side windows are ⅜-inch safety glass. The sliding windows are mounted in steel frames which are seated against a rubber seal to prevent leakage of air or water. Fittings where control cables pass through the supercharged cabin shell are designed with a special gland, the result of a long process of experimentation, which allows them to slide freely with but a nominal amount of air leakage.

The Company was able to utilize features of their other large planes, and, with this background of knowledge, add to them the particular requirements of the new transport. The Stratoliner's wings, for example, are substantially the same as the wings of the B-17 type Flying Fortress. They are all-metal, tapered wings with a span of 107 feet 3 inches, and a symmetrical airfoil section. The root sec-

(*Turn to page 116*)

BENDIX RADIO

# BENDIX AIR RADIO NEWS

MAY 1940 Published by BENDIX RADIO CORPORATION, Baltimore, Md. Cable Address BENRAD

# BENDIX RADIO EQUIPMENT ON THE NEW PAN AMERICAN GRACE DC-3'S

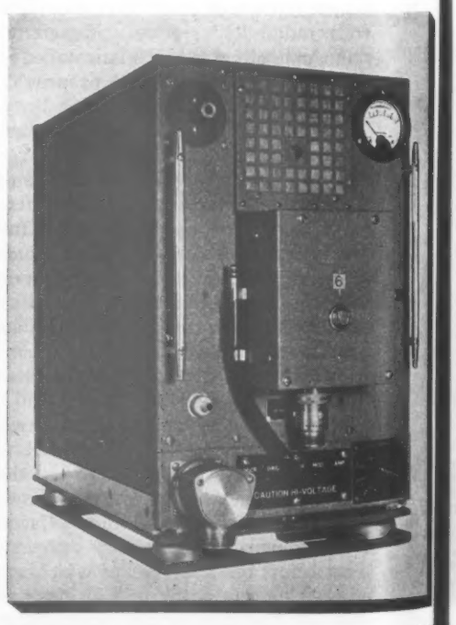
**New Pan American Grace DC-3 Airliner,** with the passengers disembarking at Cristobal, Canal Zone. These giant airliners offer safe, modern, luxury service, connecting Buenos Aires on the East Coast, Santiago on the West and Cristobal, Canal Zone, 4½ days from Buenos Aires to New York. They serve 21 cities and 7 countries, covering the west coast and mid-central section of South America.

## Help Maintain 100% Plane-To-Ground Communication Over Long South American Route

## New Airliners Flying Panagra Route From Cristobal To Santiago and Buenos Aires

**The Famous Panagra Route** is one of the most important arteries of the South American Air-Transport system. Flying over jungles, deserts and mountains, Panagra Airliners require Radio equipment of utmost reliability, to maintain communication with their ground stations. The installation of Bendix Equipment is playing an important part in maintaining the high record of safety and reliability the line has established over this difficult route.

**Panagra Field at Lima, Peru.** This field is an important link in the Panagra Line and is one of the five points served in Peru. The operations control office is located at Lima and it also has one of the 42 radio stations established by the Line to provide weather service, and to maintain constant communication with the Airliners at any point in the Route.



**The Bendix TA-2 Transmitter** provides an output of 1[illegible] watts on any of 8 channels, each of which can be s[illegible] lected automatically from the operating position. Th[illegible] famous Bendix Transmitter has proved its reliability [illegible] practically every country of the world in airline, mi[illegible] tary, naval and other type services, and is represent[illegible] tive of the high engineering refinement and depend[illegible] bility of Bendix Radio Equipment.

BENDIX—STANDARD FOR THE AVIATION INDUSTRY

# AVIATION FINANCIAL TRENDS

**By Selig Altschul**

THE most sensational market performing group in recent months has not been the "war babies," but their counterpart, a peace time "specialty." Although the aircraft manufacturing group rallied the market at the outbreak of European hostilities last September, it remained for the air transport stocks to record the best gains to date. This performance is clearly portrayed by the accompanying chart showing the action of the general market as contrasted with that of the two aviation groups.

Stimulated by an outstanding safety record and continuing to attract an increasing percentage of the travelling public, the air lines commenced to realize the earning power they were known to possess. Investors, quick to appraise the changing tide in the fortunes of the industry, rapidly bid up the prices of air line equities. Present market prices evaluate the entire domestic air transport industry at approximately $130,000,000. By way of comparison, at the time of the passage of the CAA in June, 1938, it would have been theoretically possible to purchase the equity of the entire industry for less than $35,000,000.

The growth characteristics of the industry may well justify this almost four-fold increase in market values in less than two years. Cool perspective however, may check any wild hysteria for air transport equities. Total assets of the industry as of December 31, 1939, aggregated about $47,000,000. Gross operating revenues reported for the year 1939 totaled about $52,000,000 with net earnings less than $3,200,000. Admittedly, 1940 earnings may easily double 1939 results, but may not continue at a rate to generate spiraling higher market prices from present levels.

Available reports for the early months of this year augur well for a new high in earnings for 1940. Estimates place the industry at the break-even point for the first quarter of this year. During 1939, the industry did not start showing a profit until April and it was not until June that it offset its losses of previous months.

Of the major companies, American and Eastern thus far are showing the greatest improvement over 1939.

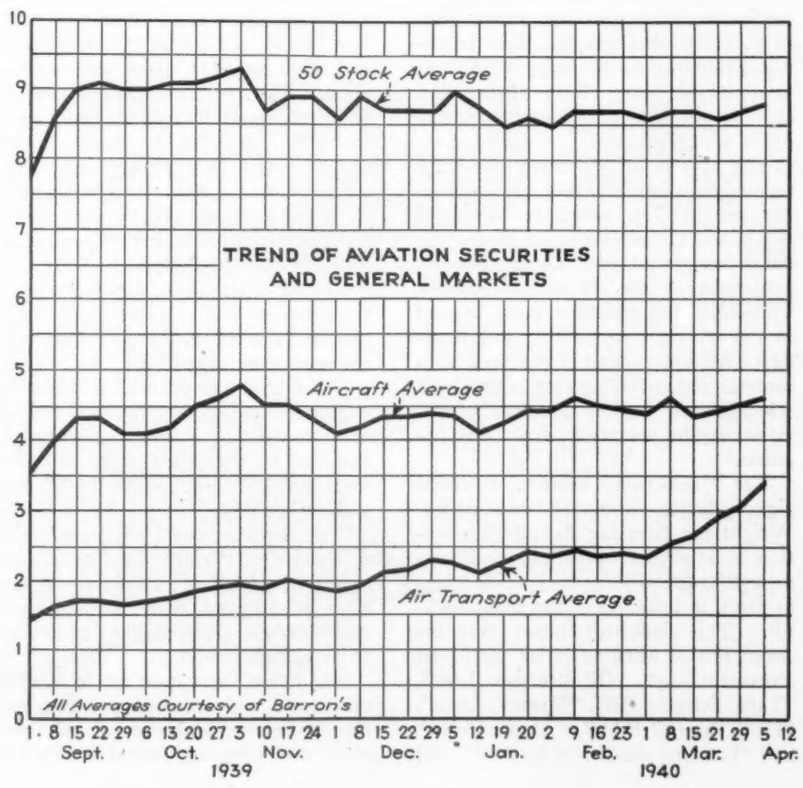
Estimates for the full year 1940 by all companies are extremely optimistic.

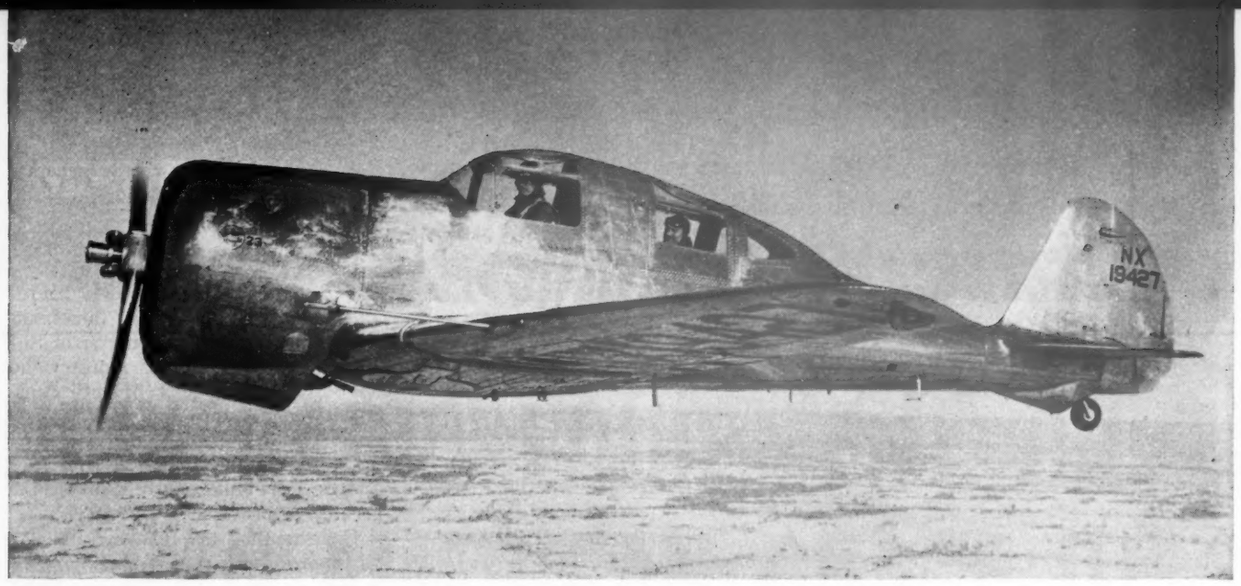
American estimates that it will fly almost 315,000,000 revenue passenger miles in 1940 ,compared with 207,360,215 in 1939, an increase of 51.9%. This should place American's passenger revenues over the $16,000,000 mark as compared with $10,712,958 for 1939. This, of course, assumes that no material reduction will be made in passenger fares.

United Air Lines also estimates an increase of 52% in revenue passenger miles for 1940 over 1939. On this basis, revenue income should be increased to about $11,500,000 as contrasted to $7,621,801 for 1939. The

(*Turn to page 120*)

| | Barron's Aircraft Average | Barron's Transport Average | Barron's 50 Stock Average |
|---|---|---|---|
| Sept. 1, 1939. | 36.10 | 14.38 | 78 |
| 8, | 40.25 | 16.41 | 86 |
| 15, | 42.65 | 17.12 | 90 |
| 22, | 42.80 | 17.12 | 91 |
| 29, | 41.12 | 16.91 | 90 |
| Oct. 6, | 41.50 | 17.09 | 90 |
| 13, | 42.22 | 17.78 | 91 |
| 20, | 45.02 | 18.69 | 91 |
| 27, | 46.38 | 19.47 | 92 |
| Nov. 3, | 48.65 | 19.53 | 93 |
| 10, | 45.32 | 19.22 | 87 |
| 17, | 45.12 | 20.03 | 89 |
| 24, | 43.35 | 19.12 | 89 |
| Dec. 1, | 41.42 | 18.72 | 86 |
| 8, | 42.30 | 19.62 | 89 |
| 15, | 43.68 | 21.34 | 87 |
| 22, | 43.75 | 21.94 | 87 |
| 29, | 44.15 | 23.06 | 87 |
| Jan. 5, 1940. | 43.98 | 22.81 | 90 |
| 12, | 41.52 | 21.72 | 87 |
| 19, | 42.80 | 22.91 | 85 |
| 26, | 44.38 | 24.25 | 86 |
| Feb. 2, | 44.65 | 23.78 | 85 |
| 9, | 46.08 | 24.47 | 87 |
| 16, | 45.03 | 23.78 | 87 |
| 23, | 44.52 | 24.09 | 87 |
| Mar. 1, | 44.00 | 23.94 | 86 |
| 8, | 46.15 | 25.91 | 87 |
| 15, | 43.75 | 26.81 | 87 |
| 21, | 44.50 | 29.28 | 86 |
| 29, | 45.50 | 30.81 | 87 |
| Apr. 5, | 46.95 | 34.00 | 88 |






## Curtiss-Wright's New

# BASIC COMBAT FIGHTER

THE Curtiss-Wright C-W 23 is a new high-speed, heavily-armed basic combat plane which is being made in the St. Louis Airplane Division. It is a two-seater designed to have a wide variety of uses.

While designed primarily as a combat ship, it may also be used for tactical training missions, attack gunnery, aerial photography, light bombing, photographic gunnery, radio communications, long range observation and reconnaissance, and for instrument flight assignments.

The ship is an all-metal, low-wing monoplane with fully retractable landing gear. Top speed is over 325 m.p.h. and the airplane can climb over 3,000 feet per minute. Design permits armament of six .30 and .50 caliber Colt-Browning machine guns located in the wings, rear cockpit and fuselage. The rear cockpit is equipped with controls and swiveling seat so that both pilotage and flexible gunnery operations may be performed from that position.

The "Tell-Tale" system, a visual signal device developed by Curtiss-Wright for directing the pilot's attention to improper operating conditions as well as identifying the specific items at fault, is installed in the front cockpit. This indicator panel contains seven sets of warning lights for "Fuel Pressure Low", "Oil Pressure Low", "Tank Selector Off", "Mixture Lean", "Low Prop R.P.M.", "Flaps Down" and "Landing Gear Not Locked", and a test button identifying burned out lamps.

The two cockpits arranged in tandem are fully enclosed, have sliding transparent panels on each side, and are equipped with cockpit and instrument lights. Both cockpits contain pilot controls for the elevator, aileron, rudder, elevator and rudder trim tabs, foot brakes, engine and propeller unit, fuel tank selector valve and wobble pump. The front cockpit contains, in addition, a hand parking brake control, hydraulic hand pump, engine primer and starter control and electrical control panel. The windshield of acrylic plastic is in one piece. Latches on the two outward swinging doors are "rotary" type.

The fuselage is of semi-monocoque construction with a covering of skin of aluminum alloy sheet. A baggage compartment is provided.

The engine mount, with a steel tube engine mounting ring having welded lugs containing rubber cushions, is mounted to the fuselage by four fittings of the "quick detachable" ball and socket type.

The airplane may be powered with a 9-cylinder Wright Cyclone engine or a 9-cylinder Pratt & Whitney Wasp, and is equipped with an automatic constant speed propeller controlled from either cockpit.

Aluminum sheet used for cowling is reinforced with channel and hat section stiffeners, and consists of three parts, each covering approximately 120 degrees of the engine periphery. The cowl design is unique in that the two upper parts are fitted tightly to the fuselage at the rear of the cowling, thus the cooling air enters the front of the engine compartments evenly around the periphery of the engine, but is exhausted at the bottom only.

Left and right main fuel tanks, each of 50 gallons capacity are integral in that they are liquid tight compartments in the center section structure. A fuel gauge selector switch is incorporated in the pilot's selector dial. The carburetor fuel pressure outlet is connected to the "Tell-Tale" panel fuel pressure warning signal so that a light will indicate low fuel pressure. The oil tank has a service capacity of 9.45 gallons, and an overload capacity of 12.75 gallons with ample provision for expansion, and is mounted in front of the fire wall.

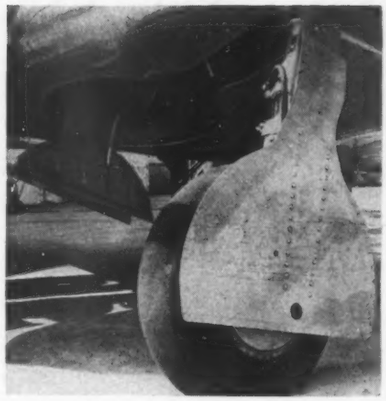
The electrical system is a 12-volt, single conductor, grounded system except where two conductor circuits are necessary to avoid compass magnetic interference. The starter installation consists of an electric hand inertia type starter controlled from the front cockpit with a cranking attachment extending through the engine cowl for hand cranking. Instruments in the front and rear cockpit are lighted by individual rim lights; cockpit lights illuminate control equipment. The plane is electrically shielded and bonded for radio.

The wing, of multi-cellular riveted

construction, is made up of outer panels bolted to a center section, the latter being integral with the fuselage. Wing tips are removable. External riveting of the forward 30% of the chord of both upper and lower surfaces is of the flush type, the remainder of the heads being of the brazier type. The airfoil contour is maintained by aluminum alloy formed sheet metal ribs; the bottom structural member of the center line is a strong aluminum alloy inverted "T" section, intended to serve as an emergency landing skid in the event of a landing with retracted wheels.

Split trailing edge flaps extend from one aileron inner edge to the other. The flaps are actuated by a hydraulic cylinder which is controlled by a valve in the cockpit, their position being shown by an electrical indicator so that partial flap deflections for take-off can be obtained by manipulation of the control valve.

The aileron, of all metal aluminum alloy construction, consists of a channel spar, channel ribs and sheet metal covering. A continuous type hinge is riveted to the front of the spar. The hinge pin is hardened steel wire; the control horn, of aluminum alloy, is riveted to the spar near the inner edge of the aileron. The ailerons are dynamically and statically balanced.



**The landing gear, actuated hydraulically by means of a power system or emergency hand pump, is automatically locked in the down position.**

Ailerons and elevators are operated by the conventional stick. The aileron operating cables are so fastened to a quadrant mounted on the torque tube connecting the two sticks that the severance of one cable, within or without the cockpit, will decommission but one aileron, thereby permitting continued control of the airplane. For elevator operation, a short push-pull tube is fastened to the lower end of the rear stick. The rudder is actuated by cables fastened to the pedal support links. Ball bearings are used at all major points in the control system.

The stabilizer, of all-metal construction, is cantilevered from and is integral with the fuselage. Stabilizer tips and fin tip are removable. Fin construction is similar to that of the stabilizer, being of aluminum alloy, cantilevered from and integral with the fuselage. The rudder construction is similar to that of the elevator but there is only one shear web at

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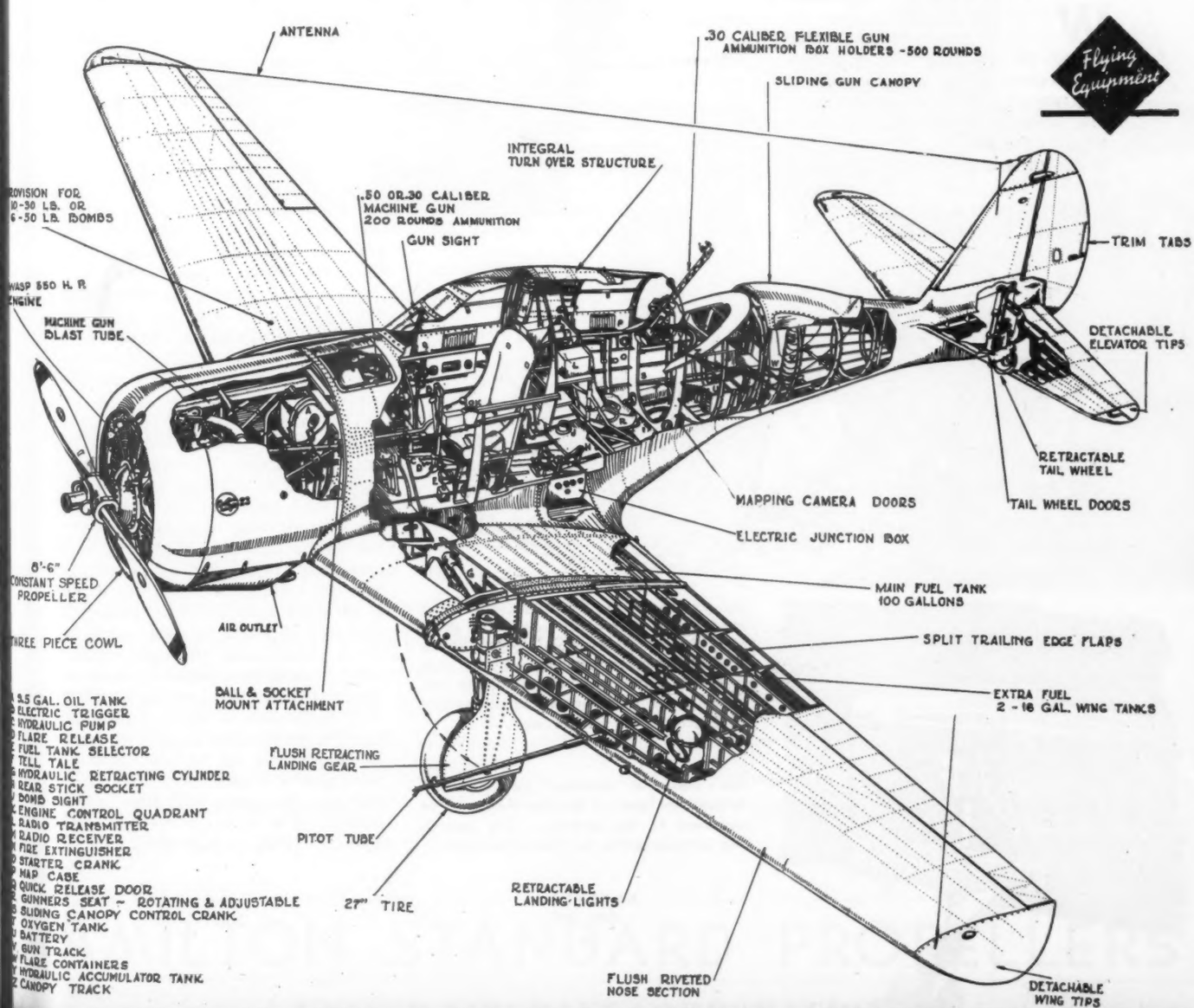

Maintenance Note Book

# Fairchild Trainer for 1940

WITH the attitude of the Air Corps apparently drifting towards the low wing primary trainer it is important when a new model of this type of ship has been accepted. The Fairchild M-62 has been designated by the Army as the PT-19 and at present is in quantity production at the Fairchild plant in Hagerstown.

Built to have a strength factor of 10 the new trainer has the ATC #724. Aerodynamically the wing has been designed so that the wing tip should remain unstalled even after the wing root has passed the stalling point. Ease of servicing has also been a prominent feature of the design and in addition to the regular inspection holes large inspection panels have been placed at important points on the ship and can be easily removed.

The fuselage is of welded 4130 chrome molybdenum steel tubular structure. Wood fairing and fabric covering are employed except that the top of the fuselage aft of the cockpit is metal covered. Army type seats are adjustable vertically 7½ inches and are designed to accommodate seat pack parachutes. Rudder pedals are adjustable in three positions, and a parking lock is supplied to lock the rudder bar in neutral position and the stick in forward center position.

The wing construction consists of a center section and two outer panels with conventional two-spar construction, both spars being at 90° to the plane of symmetry. Ribs are Warren truss type with spruce cap strings and bracing, and end ribs, landing gear ribs and those at the fuselage attachment are chrome molybdenum. Split flaps, manually controlled, extend from fuselage to outer wing panel. Ailerons are statically and aerodynamically balanced fabric-covered aluminum alloy structures and are differentially controlled.

The plywood-covered wing was chosen for its structural characteristics of lightness and large tortional rigidity. The improved type of plywood used for the wing cover is of the phenolic glue bonded type which has been developed from plywood used previously in aircraft construction. Phenolic resin gives a glue line which is stronger than wood in shear; is insoluble in warm or cold water, in dilute alkalis, acids and such organic solvents as alcohol, benzine and ether. Dry or humid conditions do not affect it; it is repellent to living organisms; and it is not attacked by mold or fungi. When properly set by heat, phenolic resin glue is a hard inert solid which does not deteriorate with time or exposure. The plywood cover is pre-

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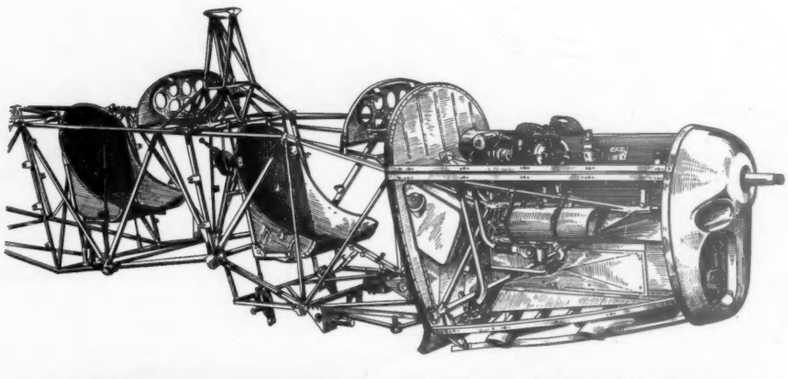
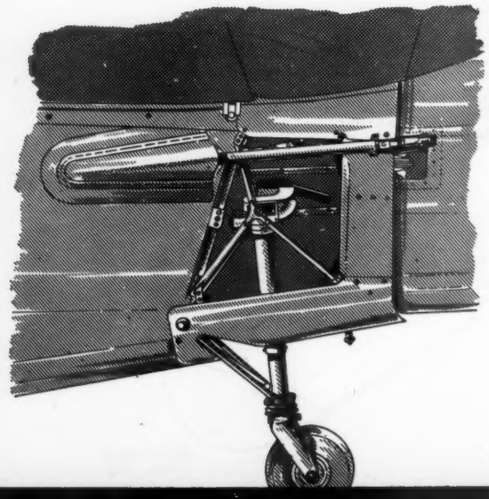
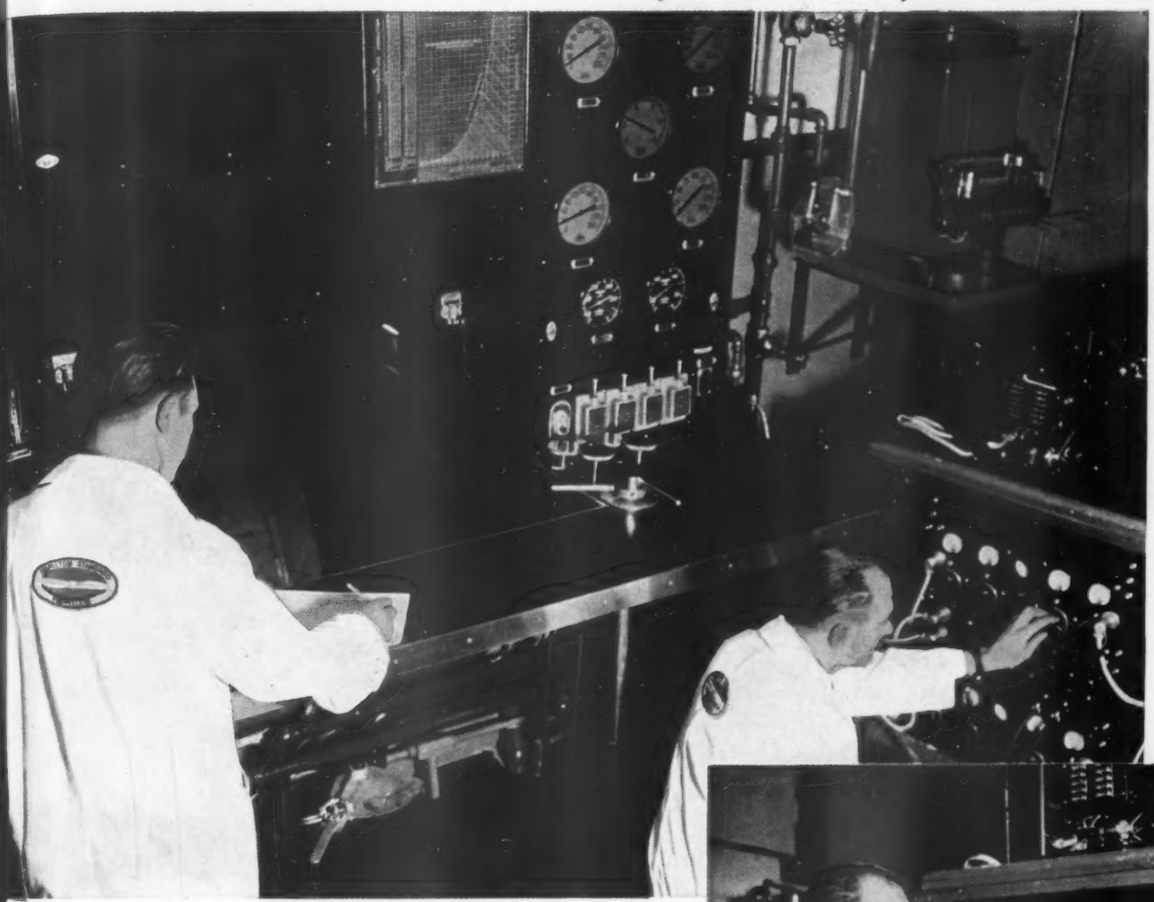


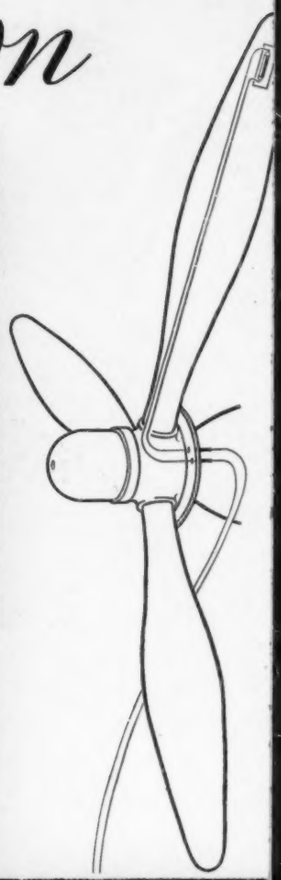


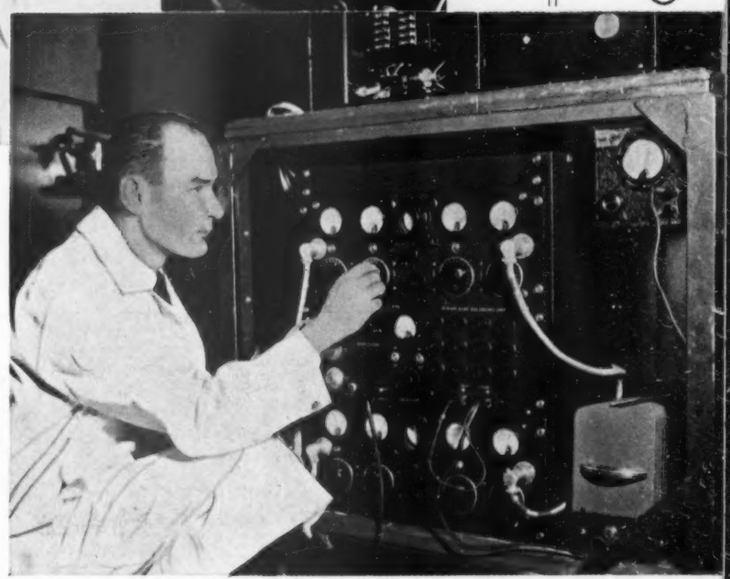
**The fuselage of the Fairchild Trainer is of welded steel tube construction. The structure just aft of the front cockpit is the crash bulkhead which supports the ship in case it noses over. The complete unit including oil tank, engine and accessories is detachable at the fire wall.**

**The steerable tailwheel is controlled through the arm at the top that extends rearward in the drawing. The section that is removed is the inspection plate.**

# *In Pursuit of Perfection*







THROUGH THE OBSERVATION WINDOW of a Hamilton Standard test house may be seen a Hydromatic propeller undergoing vibration stress tests. Leading from a small carbon resistor attached to one of the propeller blades, two fine wires are transmitting electrical impulses to the oscillograph at the right. Here they are amplified and photographically recorded . . . *and for the first time in aviation history,* the exact stresses can be determined at any given point on the propeller, throughout the complete range of operating power.

This modern method of propeller testing, the product of eight years of intensive engineering study and research by Hamilton Standard, is now habitually used for tests both in the laboratory and during flight. Its significance is obvious.

Once the stresses are known, factors of safety are known. Propellers can be designed for adequate strength with minimum weight. In a broader sense, the design of engines and propellers may also be improved.

This unique development is typical of the reasons why Hamilton Standard Propellers are so widely used throughout the world . . . continuous improvement . . . unflagging pursuit of perfection.

## HAMILTON STANDARD PROPELLERS

*One of the three divisions of* **UNITED AIRCRAFT CORPORATION** *East Hartford Connecticut*

BOMBING SQUADRON 4

SCOUTING SQUADRON 72

BOMBING SQUADRON 3

FIGHTING SQUADRON 4

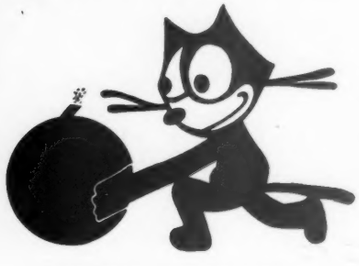
SCOUTING SQUADRON 42

U. S. NAVAL AIR STATION, PENSACOLA

BOMBING SQUADRON 2

UTILITY SQUADRON 1

FIGHTING SQUADRON 2



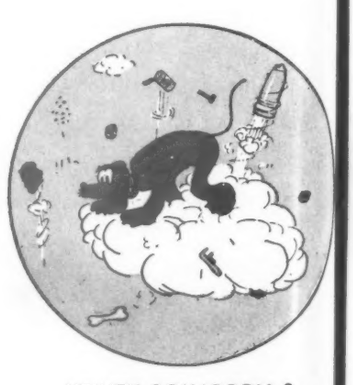
FIGHTING SQUADRON 3

FIGHTING SQUADRON 7

SCOUTING SQUADRON 41

# United States Navy Aircraft Squadron Insignia

Behind the insignia of the Navy's aircraft squadrons lie the proud records of many great contributions to America's first line of National Defense. During more than twenty years of faithful service in the Navy, Vought-Sikorsky airplanes have been privileged to play a leading part in the writing of those records.



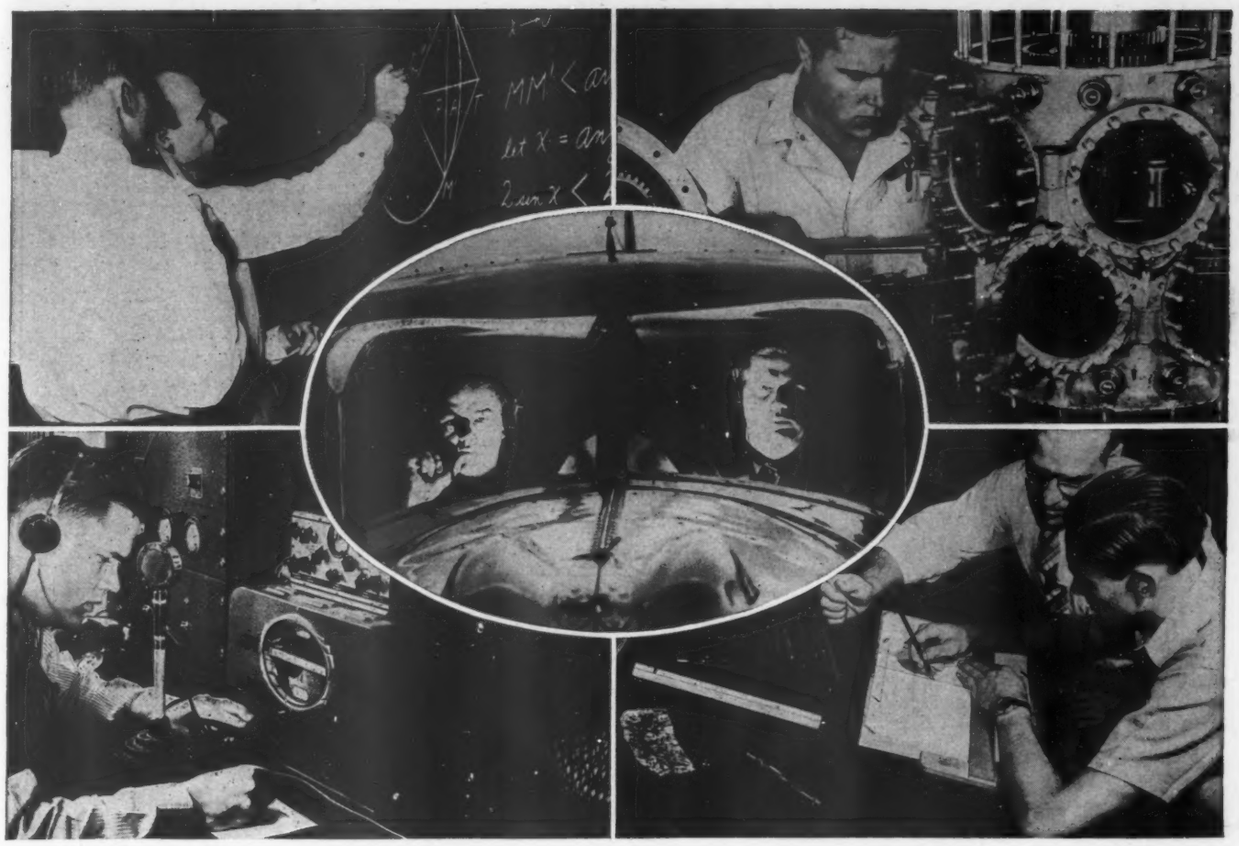
UTILITY SQUADRON 3

**VOUGHT-SIKORSKY AIRCRAFT**

**STRATFORD, CONNECTICUT**

**ONE OF THE THREE DIVISIONS OF UNITED AIRCRAFT CORPORATION**

UTILITY SQUADRON 2



## PARKS Prepares You for Leadership in Aviation by Training You to Think for Yourself . . .

To succeed in aviation you must develop your capacity for resourceful, independent thinking.

Parks' educational policy is designed to train you to think a problem through for yourself; to develop your powers of judgment and reasoning.

All activities at Parks are designed to develop your qualities for leadership. The atmosphere is that of a liberal college, although courses are specialized. The faculty-student ratio is 1 to 9, so that each student receives the benefit of close, interested, personal attention from his instructors.

You'll find definite proof of the value of Parks' policy not only in the industry's demand for and acceptance of Parks graduates, but in the successful careers of hundreds of these men. The training that served as the foundation for their success will serve you as well. Parks training will qualify you to win and hold positions of leadership and responsibility — leadership that comes as a result of worth-while contributions to aviation's development.

If your goal is to advance far beyond routine work, to develop your own capacity for leadership, it will pay you to get all the facts about Parks. Four complete courses are offered; Professional Flight and Executive, Aviation Operations and Executive, Maintenance Engineering and Aeronautical Engineering. Mail the coupon today for complete information on each of the courses. The catalog will be sent you free of charge or obligation.

AV-5

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**PARKS AIR COLLEGE** East St. Louis, Illinois

# FLIGHT TEST

## of the Curtiss-Wright Transport

IT TOOK less than ten seconds for the 19-ton Curtiss-Wright Transport to leave the ground once the blocks were pulled to start its maiden flight. This is but one of the many pertinent results that came out of the ships first test flight. It isn't every day of the year that its possible to look into the report of such a flight test and the following paragraphs taken from the Curtiss-Wright report are aimed at giving a summarized picture of what went on while the transport was put through its paces.

Eddie Allen has been in charge of the flight testing being assisted by Dean Smith and Willis Wells of Curtiss-Wright's St. Louis plant.

"The new airliner, technically known as the CW-20, was loaded to 27,000 pounds gross weight at a C. G. of 24% of the M. A. C. for the first flight. The wind was 20 M. P. H. and the airport (St. Louis) pressure altitude was 310 feet. Most of the tests were conduced at 4,000 feet.

"Power used in take-off was 1150 b.hp. per engine, which corresponds to a take-off loading of 11.75 lbs. per hp. This is a higher loading than it will maintain when maximum take-off gross weight and power are later used.

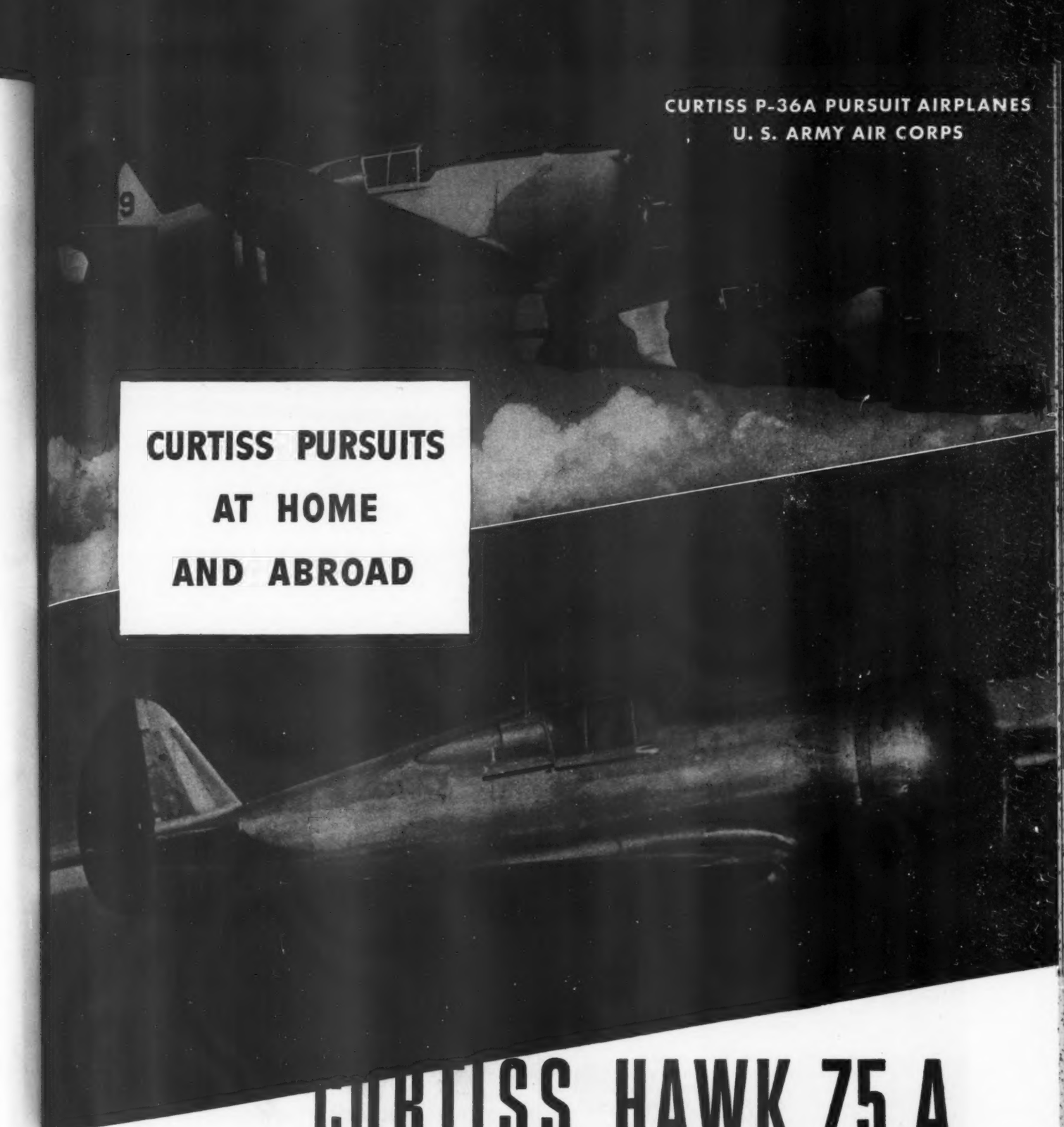
"The flaps were set for take-off at 15°, or about one quarter of their full travel. This angle was decided upon as a result of simulated takeoff tests and seemed to be a comfortable compromise. During the flight the flaps were raised and lowered several times and operated perfectly. Longitudinal trim was practically unaltered when flaps were moved, and the airplane seemed quite as readily controllable with flaps in any position. At one time, with the airplane flying at low speed and power, the flaps were retracted at full retraction rate with practically no loss of altitude. The landing gear and tail wheel were raised a short time after take-off and lowered just before landing. The retracting mechanism safety latches, and position indicators seemed to act promptly and positively.

"Preliminary tests were made of air control effectiveness and stability. The use of power controls made handling easier, despite the fact that surface tab balances were set in their least effective positions to avoid any possibility of overbalance. The power controls were used during most of the test.

"Tests were made with various rpm. and b.m.e.p. readings. Changes in throttle setting seemed to have but a minor effect on longitudinal trim even when flaps were used. With an outside air temperature of 50° F., at no time during the flight and including the take-off period, did any cylinder head exceed 380° F. Without cowling changes, it now seems perfectly feasible to hold the maximum temperature for cruising to a constant value of 400° F., under any air conditions.

"While the airplane was only maneuvered gently and not flown at high speed, there were no skin wrinkles in evidence and no tendency of any part to vibrate or flutter was noted. No difficulties of any kind were experienced with power plant operation, brake operation, instrument vibration, hydraulic system, electrical system or other units where difficulty is frequently experienced on the first flight."

The new Curtiss-Wright Substratosphere transport is one of the largest airliners to have been built having a wing span of 108 feet, and being 75 feet long and being 19 feet 2 inches in height. Her two 1700 H. P. Wright Double Row Cyclone engines, equipped with two three-bladed, 15-foot Curtiss Electric, controllable pitch, "full-feathering" propellers, provide her with a cruising range of 210 M. P. H. and a maximum speed of 243 M. P. H.




# CURTISS HAWK 75 A

## *Powered by the* 1200 H.P. WRIGHT CYCLONE

The latest models of the world famous Curtiss Hawk 75A series of pursuit airplanes are equipped with 1200 H.P. Wright Cyclones—200 H.P. more than the original models.

Other improvements in the model are of armament and aerodynamic design and with the new engine they give substantially higher performance and greatly increased military effectiveness.

CURTISS-WRIGHT CORPORATION • CURTISS AEROPLANE DIVISION
Buffalo *"The Pioneers of Aviation"* New York

Curtiss PRECISION-BUILT ARMY AND NAVY AIRCRAFT

# FORTY-ONE TONS TAKE OFF *with the aid of* PESCO PRODUCTS

*PAN AMERICAN CLIPPER*

## PESCO HYDRAULIC FUEL SYSTEM

**LIGHT-WEIGHT POWER TRANSMISSION FOR OPERATING FUEL PUMPS AT TANK LEVELS . . . ALSO APPLICABLE TO OTHER MECHANICAL UNITS**

**PESCO HYDRAULIC PUMP,** or generator, is an efficient engine-driven unit designed to create the required hydraulic pressure.



**PESCO HYDRAULIC STORAGE TANK** provides a constant available source of hydraulic fluid (one quart) and prevents the admission of air bubbles into the hydraulic lines.



**PESCO HYDRAULIC MOTOR,** or turbine, located near the fuel tanks, transforms hydraulic energy into mechanical motion to operate a fuel pump.



**PESCO FUEL PUMP,** coupled to the hydraulic motor, embodies an adjustable pressure relief valve to control fuel flow according to desired discharge pressure.



**PESCO FUEL CONTROL VALVE,** or selector valve, provides flow from one of several inlet lines to a common discharge line. A wide selection of models available.



• Thousands of successful take-offs are made daily with the aid of reliable Pesco fuel pumps, hydraulic systems, air pumps and other accessories. An interesting example of engineering resourcefulness is the hydraulic fuel system, originally Pesco-developed for the giant clipper ships, and designed to insure proper fuel delivery where excessive lift or vapor lock conditions impair the efficiency of engine driven pumps.

**PUMP ENGINEERING SERVICE CORPORATION**

*DIVISION BORG-WARNER CORPORATION*

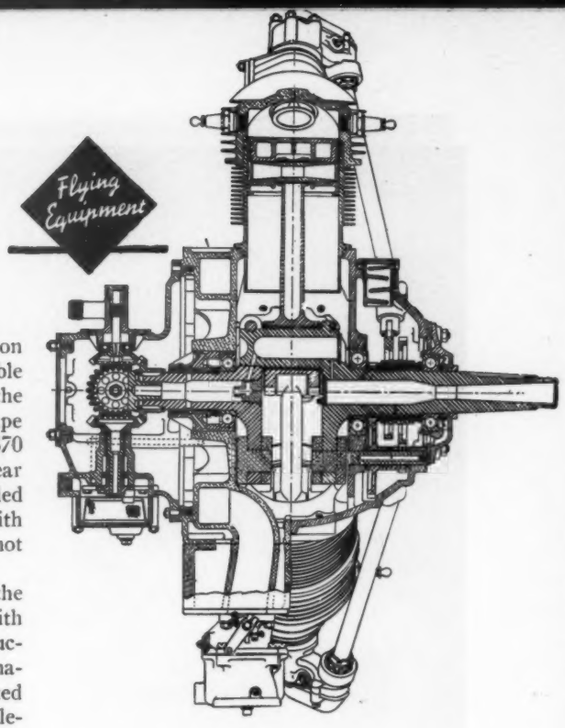
12910 TAFT AVENUE CLEVELAND, OHIO, U. S. A.

PESCO

# Lenape "Brave"

## 95-hp. engine for light planes

Flying Equipment



**By Everett Rudloff**
*Lenape Aircraft Motors, Inc.*

ANTICIPATING a growing need for a moderately powerful training engine and for a more flexible power unit for the heavier sport planes that will be light in weight, the Lenape Aircraft Motors, Inc., of Matawan, N. J., is about to start production on a five-cylinder radial 95 hp. engine which has been contemplated for some time and has been A.T.C.'d more than a year (number 212).

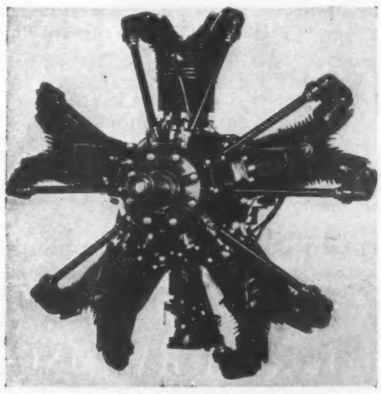
Revving at 2,200 for its rated horsepower, the new engine, called the Lenape "Brave" weighs 192 lb., dry weight. Notable features in the design include double ignition, impulse coupling on one magneto, solid steel cylinders with screwed on heads, full pressure oil feed, double springed Thompson silcrome valves, renewable valve seats and a number of other features which will be more fully described in succeeding paragraphs.

The fundamental advantage of a properly designed radial engine is thorough cooling without elaborate cylinder baffles and this feature enables the Lenape five-cylinder engine to show remarkable performance in hard, long climbs, under full throttle conditions. All cylinders are equally cooled and therefore run at the same operating temperature. This cooling efficiency in the Lenape is in a large measure the result of designs both of the solid thin wall steel barrels and the cast aluminum, screwed-on head. The cooling fins are so arranged that the air is guided to areas, which, on some engines, cause much trouble from over-heating. For example, the rear spark plug bosses on the Lenape actually run at a temperature of 370 deg. F. The accessories on the rear of the engine are adequately cooled because of this efficient air flow. With this power plant blast, tubes are not needed to cool the magnetos.

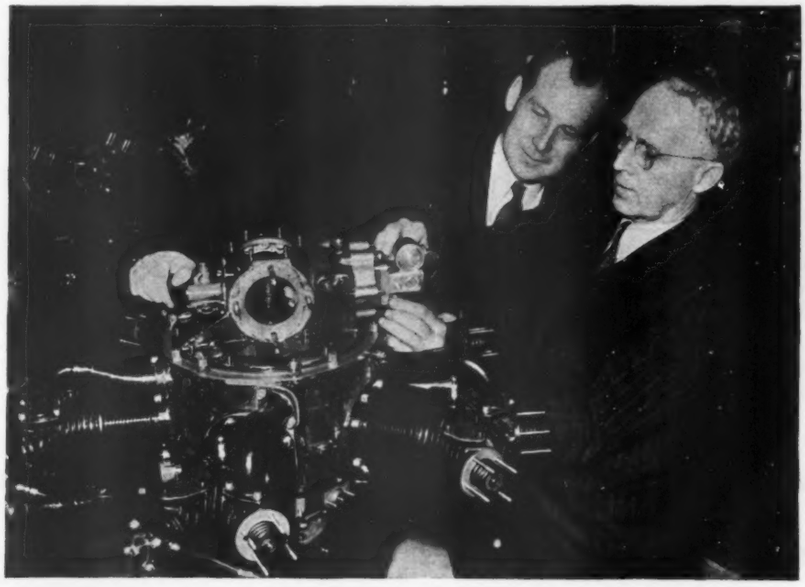
The cylinder design follows the trend of large military engines with its screwed-on cylinder head construction. The barrels are accurately machined from specially heat-treated 4130-X steel supplied by the Bethlehem Steel Company. The approximate weight of each forging is 28 lb. The barrel and its fins are machined in one piece, which then weighs 5½ lb. A specially designed Gisholt automatic lathe completes this machining in one operation. An unusually hard interior wearing surface of 270 to 300 Brinell is maintained at all times, meaning long operating life. The barrel extends approximately 2 in. inside of the crankcase, and thus the piston does not protrude beyond the end of the cylinder on the inside of the crankcase at the inner end. This feature makes ample provision for the side thrust from the power stroke and whip of the piston during the full length of the stroke.

Four heavy stepped studs fasten the inclosed oil-tight rocker boxes, housing the rocker arm mechanism, to the top of the cylinder. These studs have their lower portion ⅞ in. in diameter, threaded with coarse U. S. standard

*(Turn to page 104)*



Front view of Lenape "Brave".



**Inspecting one of the nearly completed engines is E. H. White (left) general manager, and J. J. Boland (right) chief engineer of Lenape Aircraft Motors. Boland has been a long time in aviation making his first flight in 1909, and during the last war was chief engineer of one of the Aeromarine Plant Divisions. White came to Lenape from the Glenn Martin Company where he worked on power plants for Navy boats. Prior to that he was with the Bureau of Air Commerce.**

Shown in Flight is a Vultee Vanguard Pursuit

# MEN, METHODS AND MACHINES...

**In Vultee's recently expanded factory a straight line production system coordinated by experienced craftsmen establishes a new high in aircraft manufacturing efficiency. Here men, methods and machines combine to produce the famous Vultee V-12 Attack-Bombers, Valiant Basic and Advanced Trainers and Vanguard Pursuits in large quantities.**

Vultee

VULTEE AIRCRAFT, INC.

VULTEE FIELD, CALIFORNIA, U. S. A. CABLE ADDRESS "VULTEE"

## Is Equipped with

# "NORMA-HOFFMANN"

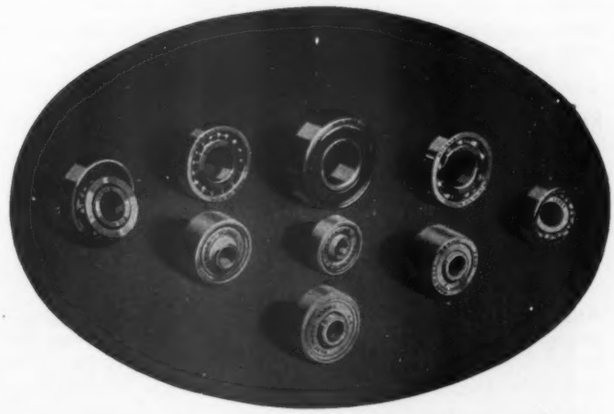
## PRECISION BEARINGS

Tests upon this newest development of Vultee Aircraft, Inc. (Downey, Calif.) are basis of the belief that it is one of the fastest, if not the fastest, military aircraft in the world. As such, maneuverability at high speeds necessitates not only extreme sensitiveness and quick response in the controls, but the utmost of dependability as well.

Significant, therefore, of the confidence of Vultee engineers is the fact that NORMA-HOFFMANN PRECISION BEARINGS are employed in the control mechanism of the "Vanguard 61"—as they are also at like points in the new Vultee "Valiant BT54" Trainer.

In the "Vanguard" and "Valiant," as well as in other Vultee models, NORMA-HOFFMANN PRECISION BEARINGS are used not only in the controls but also in the instrument equipment and elsewhere.

*"Where the bearings must not fail"*—on land, at sea, and in the air—practically every representative builder of aircraft, engines, instruments, and aircraft equipment—including the U. S. Government—employs NORMA-HOFFMANN PRECISION BEARINGS as an added assurance of safety, friction-free operation, long service, and low maintenance cost.



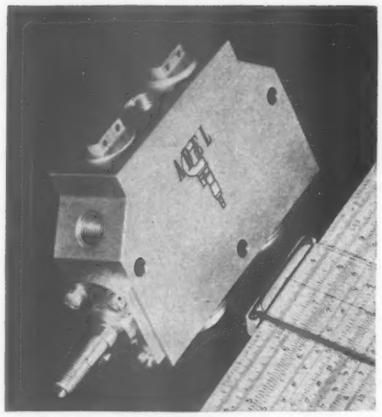
*There is a Norma-Hoffmann Precision Bearing for virtually every aircraft application — 108 distinct series and over 3000 catalogued sizes. Write for the Catalog. Let our engineers work with you.*

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U.S.A.

# BUYER'S LOG BOOK

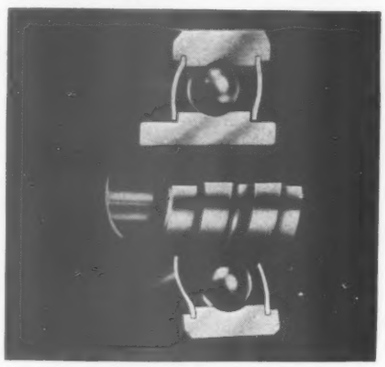
**What's New in Accessories, Materials, Supplies and Equipment**

**Presenting performance, installation and service features** intended to meet the most stringent requirements, the Adel 4-way hydraulic selector valve represents a marked advance in the design of valve equipment specifically suited to use with aircraft hydraulic systems. Manufactured by the Adel Precision Products Corp. of Burbank, Calif., the paramount aim in this design has been to obtain utmost simplicity, with compactness and light weight, together with a high rate of flow and unusually low pressure drop. Operating handle loads as low as 15 in.lb. are obtained while operating under 1,000 lb. per sq.in. pressure. This means that valves may be operated with an applied force of less than 4 lb. on a 4-in. handle. Design pressure of 4250 lb. per sq.in. is used on all sizes with provision for 3,000 lb. per sq.in. operating pressure in special units. All operating parts are readily accessible and may be removed from valve bodies without breaking line connections. Weight of the Adel valve is only 12 oz. and dimensions are 3 x 2.25 x 1 in. Models are available for capacities in excess of 15 G.P.M. and fitted for either straight or pipe threads.—AVIATION, *May, 1940.*



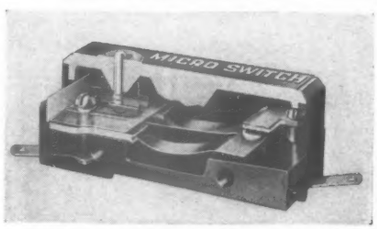
**Adel 4-way hydraulic selector valve.**

**Such demands as absolute reliability and ease of operation** of all manner of aircraft controls have made the use of anti-friction bearings for all controls, retractable gears, flaps, gun mounts, bomb doors, bomb release mechanisms, etc., practically universal. SKF Industries, Inc., Philadelphia, Pa., have specialized on development of bearings to meet such requirements and now offer a complete line of ball and roller bearings specifically designed to meet aircraft control problems.—AVIATION, *May, 1940.*



**SKF control bearings.**

**As electrical systems on aircraft** have grown more extensive, the provision of compact and reliable switches has been required. Micro Switches, manufactured by the Micro Switch Corp. of Freeport, Ill., have been specially developed for aircraft needs and are now being used widely both in this country and abroad for signaling position of retractable landing gears, automatic control of landing gear operation, wing flaps, propeller pitch control, use on bomb releases, etc.—AVIATION, *May, 1940.*




**Micro Switch.**

**Keeping pace with the rapidly increasing demand for stainless steel,** the Republic Steel Corporation, Massillon, Ohio, has recently greatly expanded its manufacturing facilities. Stainless steel is now available to the trade in a wide range of sheet and strip sizes and gages. Increasing application of stainless steel to aircraft design and manufacture is being experienced.—AVIATION, *May, 1940.*

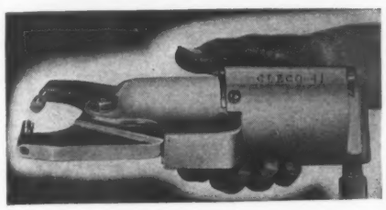
**Since many aircraft parts must be protected** against corrosion, especially in seaplane service, the aviation industry will doubtless find considerable use for the new Albany Rust Preventative "PW" which is manufactured by the Albany Grease Co., New York, N. Y. This product is said to penetrate loose rust, dries quickly, is easily removed, is water repellent, heat resistant, will not soil and is non-abrasive.—AVIATION, *May, 1940.*

**Cutting stainless steel into strips.**

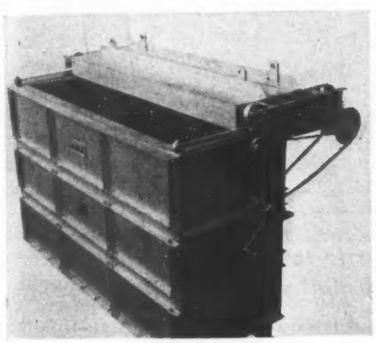
**Applicable to many operations** in machine shops or tool rooms, and on miscellaneous bench work, a pneumatically operated vise has demonstrated its ability to increase some types of production up to 50 per cent. Available in a range of five sizes, the tool is offered by the Larkin Air Vise Company of Portland, Conn.—AVIATION, *May, 1940.*

**To aid welding inspectors'** and operators to check fillet welds accurately and rapidly, a low priced fillet weld gage has been developed by the General Electric Co., Schenectady, N. Y. The gage can be used on fillets of the following sizes: $\frac{5}{16}$ in., $\frac{3}{8}$ in., $\frac{1}{4}$ in., $\frac{5}{16}$ in., $\frac{7}{16}$ in., and $\frac{5}{8}$ in.—AVIATION, *May, 1940.*

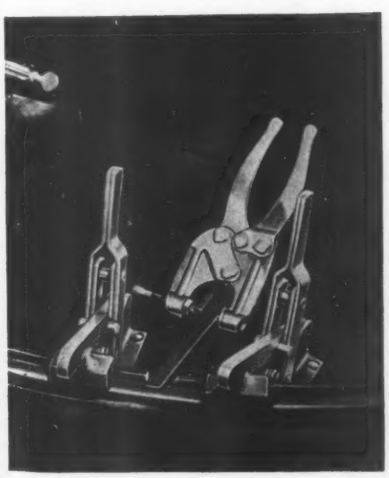
Musselman Doenut Tire



Cleco 41 rivet squeezer



Ajax furnace



De-Sta-Co Toggle Clamps.

**To fill the need** for some means of adjusting the sensitivity of Turn Indicators under actual operating conditions the A-1 Turn Indicator Sensitivity Control has been developed by Aircraft Instrument Service, Inc., Detroit, Mich. This instrument provides the pilot or operator with a means for correcting for any change in sensitivity of the Turn Indicator due to variation in suction from venturi or vacuum pumps and may also be used as a shut-off valve to protect the Turn Indicator during acrobatic flying. The device is already in service on a number of leading airlines. Total weight is 3¼ ounces. The control can be installed in a few minutes and requires but 1⅜ in. of instrument panel space.—AVIATION, *May, 1940.*

**Introduction of two new types** of lightweight air-operated riveting hammers for use in aircraft manufacture has been made by Ingersoll-Rand Company, New York, N. Y. Each is available with pistol grip, offset, or push button handles. One type is a long-stroke, slow-hitting machine for aluminum, dural, or soft iron rivets. The other is a short-stroke fast hitting riveter for general fabrication work.—AVIATION, *May, 1940.*

**Complete elimination of damage to tire valves** caused by creeping of the tire on the wheel rim is achieved in the Doenut tires and wheels offered by Musselman Products Co., Cleveland, Ohio. The Musselman Doenut tire is equipped with a valve stem which projects out through the side of the tire near the edge of the rim but not contacting it. Three tire sizes are available, 10 x 2.75 in., 12 x 3.30 in., and 16 x 4.40 in.—AVIATION, *May, 1940.*

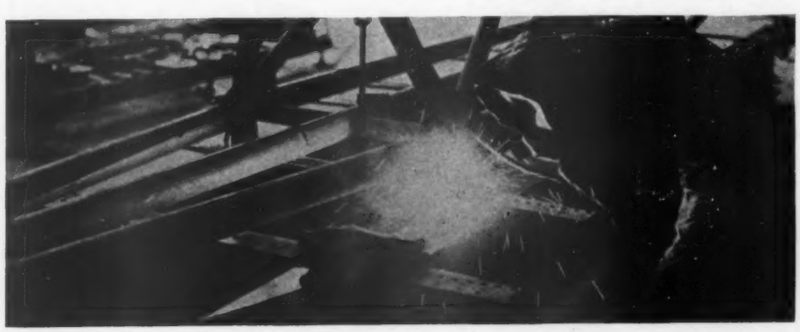
**Better and faster riveting** is made possible, especially in cramped quarters, by a pneumatic squeeze riveter introduced by The Cleveland Pneumatic Tool Co., Cleveland, Ohio. Known as the Cleco 41, the new tool is only 9¾ in. in overall length and weighs but 3¼ lb. It will handle dural rivets up to and including ⅛ in. —AVIATION, *May, 1940.*

**In response to a wide demand** for improved rapid action clamping tools for aircraft production work, two new clamping tools have been perfected by the Detroit Stamping Co., Detroit, Mich. Both clamps are of rapid action type and of rugged construction, The De-Sta-Co Toggle Clamp No. 220, "Aviation" model, delivers a pressure ratio of 33 to 1 to the clamping arm. De-Sta-Co Toggle Pliers No. 460 allows adjustment of the clamping head for a spacing of 0 in. to 11/16 in. Closing of the handles exerts a pressure ratio of 75 to 1.—AVIATION, *May, 1940.*

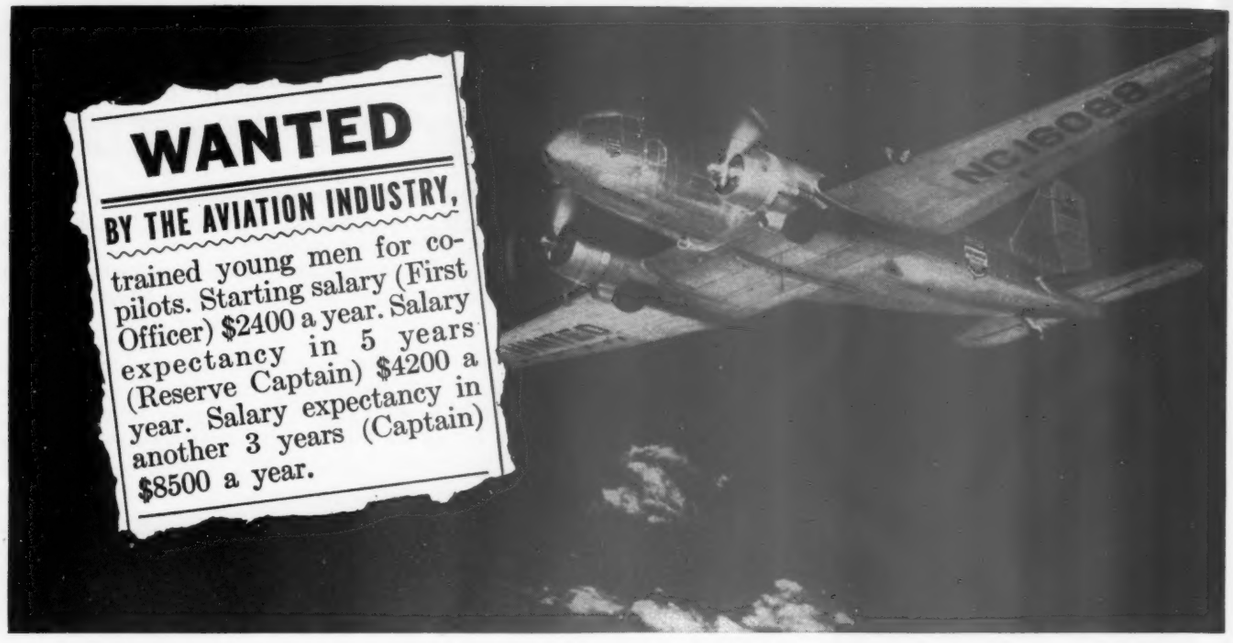
**Application of a new principle** to large nitrate baths for heat treatment of aluminum alloys results in automatic circulation of the bath by means of electromagnetic forces generated at the heating electrodes. Various heat-treat furnaces of the salt bath type and using the Ajax-Hultgren principle are now available to the aircraft industry from the Ajax Electric Company, Inc., of Philadelphia, Pa.—AVIATION, *May, 1940.*

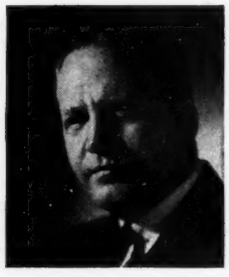
**Certain features of arc welding** are winning new converts for this method of fabricating aircraft steel tube structures. Special equipment manufactured by the Lincoln Electric Company, Cleveland, Ohio, is being widely used by Boeing Aircraft Company and other representative plants in the manufacture of some of our latest types of aircraft.—AVIATION, *May, 1940.*

*(See page 113 for Window Shopping)*



Arc welding in construction of Boeing aircraft.


WANTED
BY THE AVIATION INDUSTRY,
trained young men for co-pilots. Starting salary (First Officer) $2400 a year. Salary expectancy in 5 years (Reserve Captain) $4200 a year. Salary expectancy in another 3 years (Captain) $8500 a year.



**Says R. T. Freng,** Director of Flying, United Air Lines: "We alone will need 60 to 80 co-pilots a year for the next 4 years. Last year we hired 20 graduates of Boeing School of Aeronautics—would have hired more had there been more."

**Says George I. Myers,** Superintendent of Flying, Boeing School of Aeronautics: "This school trains men for careers in modern commercial aviation. We, therefore, train our students only with heavy, commercial-type planes—6 different types, ranging from 2500 lbs. to the multi-engined transport. In addition to the two flying courses mentioned by Mr. Lee, we train men in 9 other aviation career courses, in 17 modern shops and laboratories, U. S. Gov't-approved in all departments. Don't forget this school is owned and operated by United Air Lines, the world's most experienced air transport organization."

**Says T. Lee, Jr.,** Director, Boeing School of Aeronautics: "For young men at least 20 years old, with 2 years' college, we have created the new Airline Pilot Course—schooling time reduced 9 months, tuition reduced $2730. For high school graduates, we have reduced the tuition on our Airline Pilot and Engineering course (24 months) $1175. We do this to help meet the soaring need for highly trained co-pilots."

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THE AVIATION NEWS

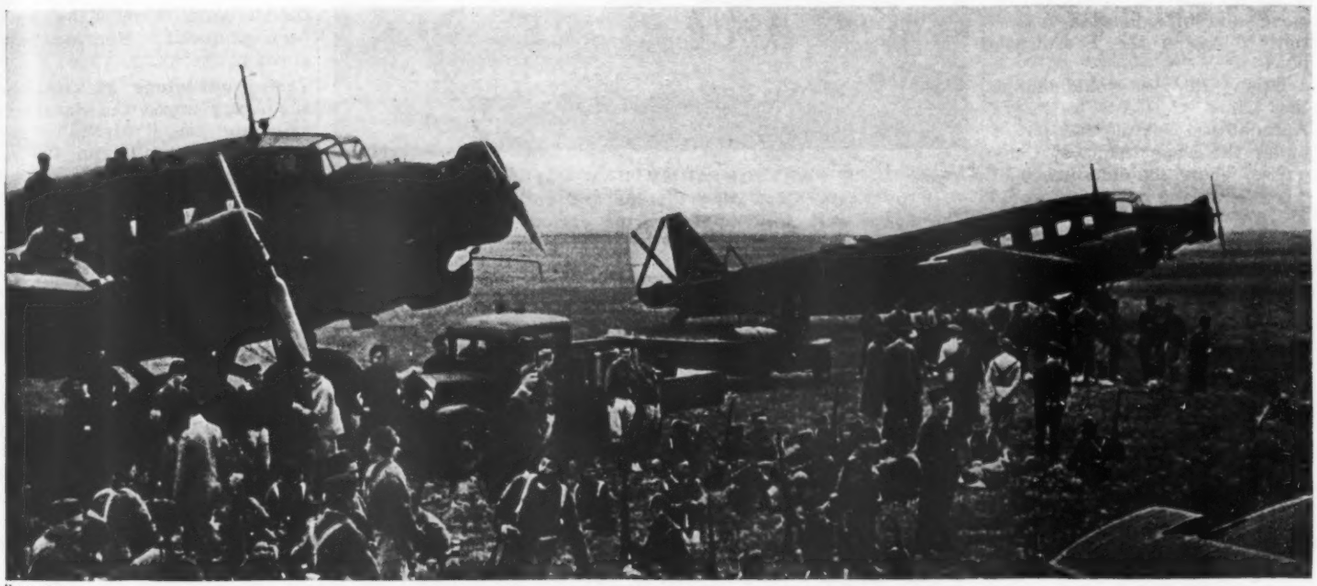
REVIEW, COMMENT, FORECAST

BLAINE STUBBLEFIELD
Washington
C. F. McReynolds, Pacific Coast
Jay P. AuWerter, New York
E. R. Lockin New York

MAY 1940

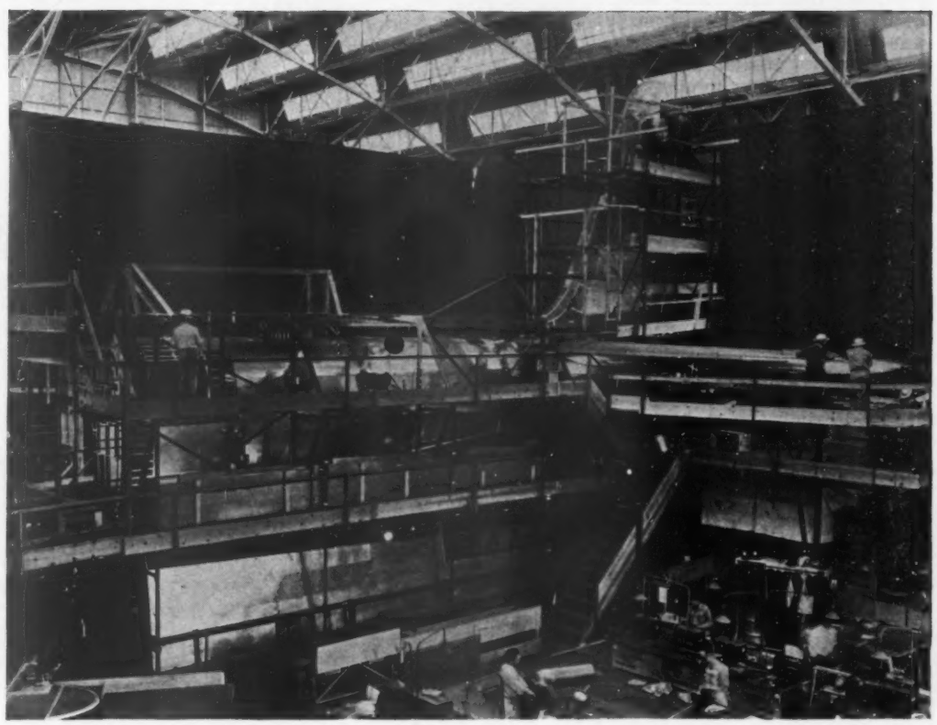
# FDR Orders CAA Back to "Commerce"

(See Story and "Spot Checking" on page 68)



European

Aviation helps to make war worse, and, whether you like it or not, war helps to make aviation better. Everybody hopes, though, that war will be grounded for good some day and that airplanes will fly for peace only. Above you see a brand new war maneuver by air: German troops are flown to Denmark and Norway in Junkers-52 planes. The Germans say thousands of soldiers thus have passed high over British mines and guns on the water. Below is shown the jigs and tail structure of the Douglas 70-ton bombardment plane being built for the Army. The useful load will be about 28 tons; wing spread 210 feet; speed over 200 mph; range more than 6000 miles; 16-foot three-bladed propellers; engines, four, tricycle landing gear. Sleeping quarters, radio compartment and navigators' space have been soundproofed for efficiency. This is the Army's effort to build a plane for a specific purpose—long-range bombing. This ship will not be sold to the Allies; they have no such distances as we have to deal with. In addition, Douglas is building powerful, fast new twin-engined bombers expected to outspeed anything of their type.



# NATIONAL AVIATION

## CAA Reorganization Fight

President Roosevelt's proposal to Congress for reorganization of the Civil Aeronautics Authority fell like a bomb in the back yards of everybody, including high officials in the Authority. Cries of anguish went up. CAA officials protected to friends, but held formal statements for hearings. Within two hours Senator Pat McCarran, father of the law, wrote a blistering attack on the move, and introduced a resolution to reject the President's plan.

Briefly, the plan would change the name of CAA to "Civil Aeronautics Board" and put it under the Department of Commerce, where the old Bureau of Air Commerce was. It would abolish the Air Safety Board and incorporate its functions within the new CAB. The Administrator's office would be continued, but he would report to the Secretary of Commerce. The five-member CAB would perform its rule-making, adjudicative, and investigative functions independent of the Commerce Department.

Critics replied immediately that the Board would not actually be independent, since its bookkeeping and its funds would be under the control of the Secretary of Commerce, and they predicted that the whole setup would quickly go political, as it was under the old Bureau.

Whatever might have inspired the President to upset the present satisfactory situation and seek reorganization of CAA when it has played so large a part in the successful aviation year just ended, puzzled all articulate observers.

Whatever the cause, the mischief is a-foot. The government reorganization law says that proposals submitted by the President will become effective unless both houses of Congress reject them within a sixty-day legislative period.

The President also proposed that the Weather Bureau be transferred from the Department of Agriculture to Commerce.

## Airports Pushed

The airport expansion program is now before the Senate in revised form in a new bill introduced by Senator McCarran which would simply authorize a national system of landing fields, but require additional Congressional action to finance the project.

This latest version follows NAA suggestions by providing that CAA apportion whatever unds are made available—$125,000,000 is mentioned—among the states according to a formula based on population, geographical area and percentage of civil airway mileage. Local administration would be carried out by special state agencies legally designated to foster airport development.

**AVIATION'S PART OF ARMY DAY was celebrated in New York by floats illustrating the ins and out of the Air Corps. The floats were contributed by the various aeronautical companies and were paraded up Fifth Avenue between two packed rows of spectators.**

## Air Races, 1940

For a long time people have been reading about automobile races and saying "I wonder why they keep on doing that." Air racing, after so few years, is drawing the same comment. But they may keep on doing it. Those who said the Cleveland race last summer would be the last, didn't really believe it. Chances are that the 1940 version of the races will be at Newark. All it needs is some run-way fixing, and a grandstand. Earl Ortman, the premier pylon duster, says a good 10-mile course can be laid over the Jersey salt grass, with only a few high tension wires in the way. The New York metropolis can furnish perhaps 100,000 ticks of the turnstile per day. Lots of people love air races, and surely some city will be willing to take their money for years to come.

## Instructor Courses

CAA believes its methods of instructing student pilots has proved so safe and successful that the system should be extended to all civil flight training. The Authority has made arrangements to enable 600 commercial pilots to take "refresher instructor" courses so they can qualify for instructors' ratings. Pilots who want to be re-rated under the standardization program are also eligible. Courses provide from seven to ten hours of instruction.

**YOU MAY HAVE SEEN the charming Lee Ya Ching and her Beechcraft at your airport, as she has been flying throughout the country raising funds for the Chinese Relief movement. A skilled pilot, she will soon fly to South America to continue her work.**

## Spot Checking

**Congress must reject** FDR's reorganization order by June 11 (60 days) or it will go into effect. If Congress adjourns before that date, a new 60-day period will start with the 1941 session.

**A search for political villains** who might have influenced the President revealed several suspects, in and out of the Authority. Observers blame them for the sweeping changes that have been proposed. Hearings will start fireworks.

**Taking advantage of real war** the Army urged the Senate to reinstate the Alaska "cold weather" air base and 496 replacement airplanes, disallowed by the House in passing the 1941 Supply Bill.

**Its aeronautics library** was given by National Aeronautics Association to the Institute of Aeronautical Sciences which already had its own and the Burden library.

**Allies placed orders** at last for about 1,500 of the 5,000 American planes they proposed to buy for $1,000,000,000.

**An air traffic survey** of the U. S. domestic system is completed and a report is issued by CAA. It shows point-to-point flow of traffic in August, 1939.

**Ames Aeronautical Laboratories** is the name given to Moffett Field, Sunnyvale, California, by NACA, with FDR's approval. Dr. Joseph S. Ames retired as chairman of NACA in October, 1939. The committee celebrated its twenty-fifth anniversary at a luncheon for present and former members, April 18.

**The Bennett Plan** for flying training under "scholarships" financed by the Government was proposed to Congress. Two coupons worth $50 each would be issued to applicants passing physical exams.

**Western Electric 32A receiver** has been adopted by Aeronautical Radio, Inc., acting in behalf of all air lines, to use CAA's ultra-high-frequency for airport traffic control and to serve as part of the plane equipment for instrument landing, which will be in experimental operation in a year or so.

**$15,000 Shell Aviation Scholarships** and awards competition will be participated in by student pilots from most of the 435 colleges in the CAA program.

## Coming Events

Apr. 28. Annual Air Maneuvres, Atlanta, Ga.
May 1–3. Spring Meeting, American Society of Mechanical Engineers, Worcester, Mass.
May 11–12. Aero Club of Kentucky's Annual Aircraft Exhibit, Bowman Field, Louisville.
May 18. Pacific Coast Inter-Collegiate Air Meet, Gardena Valley Airport, California.
May 27–28. National Aviation Forum, Washington, D. C.
June 1–2. Air Carnival, Birmingham, Ala.
June 9. Missouri State Model Airplane Contest, sponsored by Missouri State Jr. Chamber of Commerce, Municipal Airport, Columbia.
June 9. Annual Air Classic, Port Columbus, Columbus, Ohio.
June 9–14. SAE Summer Meeting, The Greenbrier, White Sulphur Springs, W. Va.
June 9–23. Annual Southwestern Soaring Contest, Wichita Falls, Tex.
June 17–21. American Society of Mechanical Engineers, Semi-annual meeting, Milwaukee, Wis.
June 25–30. Michigan Air Tour.
July 4–6. Air Show, Denver, Col.
July 7. Third Annual Air Races and Air Show, Kalamazoo, Mich.
July 7–9. National Air Congress and NAA Convention, Brown Palace Hotel, Denver, Col.
July 21. Fifth Annual Air Show, Fort Wayne, Ind.
August 18–19. Air Show sponsored by Sheldon NAA, Turner Field, Sheldon, Iowa.
Sept. 3–6. American Society of Mechanical Engineers, Fall Meeting, Spokane, Wash.

## Intercollegiate Conference

The Sixth National Intercollegiate Flying Conference was held at the Wardman Park Hotel, Washington, April 8 and 9. A banquet at the Shoreham Hotel climaxed two days of speeches and business. Representatives of the Army Air Corps, Navy Bureau of Aeronautics, Civil Aeronautics Authority, and other leaders took part. Grover Loening presented the Loening Trophy to the Purdue Flying Club for all-around excellence in aviation activity. Five hundred dollars was divided in first, second, and third prizes to Florence Kernick of Canaan, Conn.; Arthur L. Newman of New York; and George McMillan of Clemson, S. C. in the Robert H. Hinckley Essay Contest on "The Cultural Value of Flying".

## Advanced CPT Plan

Next year's plans for CAA advanced flight instruction were announced by Grove Webster at the New York Safety Council Meeting on April 17. An additional 50 hours of flying will be given to 1,000 students who complete an advanced ground course of 146 hours and who have added 15 hours of flying time to the first 35 hours given by CAA. Ground instruction will be carried on next winter, and flying will not start until June 15, 1941.

The number of non-college students for primary training will be increased to 1500 next year, and about 8,500 college students will be trained. CAA hopes to increase the number of training centers to 750.

## Southwest Conference

Southwest Aviation Conference began three days of highly successful meetings on April 25. Aviation leaders from all parts of the country journeyed to Tulsa, Okla., for the third annual affair. The program, under the direction of Moss Patterson, president of the conference, was based on recommendations made by some 3,000 persons interested in aviation.

W. G. Skelly, president of the Skelly Oil Co., was chairman of the speaker's committee and convinced a notable list of aviation people to come to Tulsa. Over 40 speakers were on the program during the three days of meetings.

**EXECUTIVE COMMITTEE, Southwest Aviation Conference. Front row, l. to r., W. H. Green, Mrs. Wm. B. Perry, Mrs. W. M. Wyatt, Mrs. Dorothy McBirney, Gerald Westby. Standing, l. to r., Wade Whiteside, Russell Cantwell, H. C. Duncan, H. M. Cosgrove, Mather Eakes, Ted Law, Stanley J. Ehlinger, H. L. Smith, Fred Q. Casler.**

# THE WASHINGTON WINDSOCK

by BLAINE STUBBLEFIELD

## $1200 Worth of Conversation

**700 Years of flying** by one person is the equivalent of the airline's year of safe operation, says W. A. Patterson of United Air Lines. When we pointed this out to our general secretary, who is twenty and has brown curls, she said "That's fine, but I don't want to fly 700 years; I just want to go for a trip in an airplane." Jane doesn't go because she can't afford to. There's another problem for you and the boys, Mr. Patterson.

**Increased cost of military airplanes** seems to have been legislated into effect to some extent by Congress itself. General H. H. Arnold, Chief of the Air Corps, testified at 1941 appropriation hearings that costs have increased (instead of going down with greater production) because of greater performance demands, guarantee of delivery dates, fear of labor trouble, splitting of awards, etc. He said too, that for years the airplane industry has been earning about four per cent profit. Then along comes the Vinson-Trammell Act, putting on a 12% profit limit. The implication was that this increased the price of planes.

**Wall Street never heard** of such strenuous back-stage doings as the Administration's pull-and-haul with the Allies over release of latest model airplanes for export at high prices. England bawled like a stuck pig about financing our plants, and balked when Morganthau told the purchasing mission to pay for development of new designs for the U. S. —or else. The mission then went straight to the President. That gentleman doesn't talk, but everybody knows he will help England and France all Congress will stand for. Isolationists say if the situation was reversed the Allies would soak *us*. Anglophiles say we're Shylocking again; we'd better help now—or fight the Allies' war later.

**A delicate situation** confronts CAA, which is urged by the Private Flyers Association to relax a rule against flying by pregnant women. Gynecologists, obstetricians and general medical opinion, sought by the CAA medical examiner, solidly uphold the rule. They say that prospective mothers are subject to syncope (fainting), nausea, vertigo, and even hemorrhage. The association, however, produced some medical opinion favoring its case. It is admitted that the rule is harsh on the women, because required months on the ground loses them their flying status.

**Now private flying** will try its hand at a demonstration of safe flying. The CAA-college schools have already made an auspicious beginning. But demonstrated safety will attract more people, and more people will buy more airplanes, but they will make trouble. Automobiles kill folks by the thousands, partly because it's an important industry, and the pressure on government to let nit-wits drive is irresistible. That same kind of pressure may some day come on private aviation.

**A high-priced bull roast** was put on for American Export and Pan American in their tiff over the Atlantic run—and the public took the check. The hearing record covered 3,018 pages. An airplane manufacturer asked for a copy and the stenographic company that took it down quoted him 30 cents a page or $1,200, with one third off for the job lot. Some lawyers in charge of this remarkable gab fest privately admitted it was unnecessary, but both sides wanted to talk, a sacred right in a democracy. Insiders knew the question was a matter of national policy and would be so decided.

## 1940 Forum

Washington (AVIATION BUREAU)—Thomas H. Beck, the livest live-wire in aviation, announces that the object of the National Aeronautic Forum and Conference (Washington, May 27–28–29–30), is to sell the people of the Americas on flying and air defense. And he means *both* Americas. The Latin countries are being told about it by shortwave and air mail.

There will be exhibits of all branches of aviation, under a Government Committee headed by Robert Hinckley, who was appointed by the President. Most exhibits will be at Bolling Field and Anacostia, served by frequent bus, and some light aircraft will be down on the Mall by the Lincoln Memorial. Several airlines and manufacturers have agreed to exhibit.

Forum meetings will be in the Department of Commerce auditorium, across the street from the Willard Hotel, new headquarters of NAA.

## NAA Meets in July

Plans have been completed to hold the national convention of the NAA at Denver, July 7–10. James Webb of Sperry Gyroscope is head of a committee working up the agenda, and William P. Redding, NAA treasurer, of the Denver Chamber of Commerce, is general manager of arrangements.

## Aviation Conference Held

The 1940 Western Aviation Planning Conference was held at Fresno, Calif., on March 30. Speakers included the Governor of California, Culbert L. Olson, Robert H. Hinckley, chairman of the CAA; Brigadier-General F. D. Lackland, commander first wing GHQ; Commander H. M. Mullinix, U. S. Naval Air Station, San Diego; John Hunter, Airport Section, CAA; William Slee, American Road Builders Association; Major A. B. McMullen, Chief, Airport Section, CAA; Elwood Cole, State Coordinator, CAA; Dudley M. Steele, president, United Airports of California; T. C. McMahon, executive secretary, Douglas Aircraft Company; Frank Fuller, Fuller Paint Co. president, and well-known sportsman pilot.

## Dress Rehearsal

It's quite a complicated job to get a legal bag of tricks ready and go to court with your lessons prepared. Even the lawyers can't always stack up their stuff in the right order. So the Civil Aeronautics Authority has announced it will hold "pre-hearings" in all airline economic cases coming before it. It's a kind of dress rehearsal. The Authority is following a pretrial procedure adopted by the Supreme Court. It must be all right.

## Calling Names

**Harold Bachman**, Pinehurst, N. C., pilot, finds that blowing low slip stream over peach orchards prevents frost formation.

**Dr. E. H. Johann Schuette**, co-founder of Germany's Schuette-Lanz air works, died in Dresden, April 1. He was colleague of Count Zeppelin.

**Lieut. James Warren Phelps, Jr.**, Berwyn, Pa., died April 3 when his ship crashed into Lake Erie near Cleveland during mimic war practice.

**Ruth Haviland**, whom Admiral Byrd taught to fly in 1928, is United's new woman's promotion director.

**Lee Swigart**, TWA's traffic manager at Kansas City, is advanced to district manager at New York City.

**T. T. Hildebrandt**, Washington, becomes U. S. Air Compressor's governmental representative.

**Dick Stoddard**, wireless operator on Howard Hughes' globe-shrinking 1938 flight, is vice-president of the Los Angeles-Hollywood chapter, Veteran Wireless Operations Association.

**Yale D. Hills** becomes assistant general manager of Timken Roller Bearing's service-sales division at Canton, Ohio.

**Hugh C. Robbins** resigns as secretary, treasurer and director, and A. E. Kongas as auditor, upon sale of Continental Aeronautic Corp. at Burbank and Glendale to Lockheed Aircraft.

**Floyd E. Evans**, Lansing, Michigan's aviation director, has released "Wings Over Michigan," 16 mm. colored movie.

**David C. Jones**, V.P. and Gen. Mgr. The Lunkenheimer Company, Cincinnati, died March 11 following a brief illness.

**John W. Kenny** has resigned as vice-president of Spencer-Larsen Aircraft Corp.

**The CAA** was officially "absolved" of any bias in approving LaGuardia Field as New York base instead of Newark, March 19, by a Senate commerce subcommittee which denied a resolution to investigate.

**William Stanley Rust**, CAA inspector, died March 13 in an airplane accident near Hicksville, New York.

**Bakelite Corp.** held last of three technical meetings March 12 at The Franklin Institute, Philadelphia.

**Carl A. Swanstrom**, president, Elastic Stop Nut Corp., died March 12 after an extended illness.

**Gill Robb Wilson**, NAA president, is named to national board of judges of $15,000 Shell Oil Company's "Aviation Awards Competition." The fund provides intercollegiate aviation scholarships for student pilots. It is administered by Institute of the Aeronautical Sciences.

**Jackie Cochrane** claims another speed record; on a 2,000 kilometer course at 324 m.p.h. elapsed time was 3 hours, 44 minutes, 47 seconds.

**Edith Olsivie Druce** made a 3-minute flight with the late Wilbur Wright; on April 4, she made her second flight at LaGuardia Field as a guest of American Airlines.

**Eastern Airlines** flew 4,000 pounds of office equipment; Boeing Air Transport did it 13 years ago.

**Northwest Airlines'** new publicity agent, **Joseph A. Ferris**, released his first yarn—on himself.

**TWA** appoints **I. S. Randall**, eastern region manager, as assistant to board chairman **T. B. Wilson**, with headquarters in New York.

**EAL** appoints **Frank J. Macklin** to newly created post of Sales Manager, **Walter Sternberg**, northwestern d.t.m., at Chicago, **Daniel L. Sinkler** as d.t.m. at New York, **James P. Farrell** as traffic agent at Newark, and **Gregory Flynn**, formerly Gotham d.t.m., as director of conventions and sporting events sales. **Robert J. Smith**, V.P. at Dallas and **Hal C. Thurman**, Oklahoma City attorney, are new Braniff directors.

# DEFENSE

## '41 Money for Defense

After unusually prolonged hearings due largely to changes in aircraft release policy, the House finally received and passed the War Department military appropriation bill carrying funds for one year's expenses beginning next July 1.

Outside of operating costs, the major part of the money will buy antiaircraft, artillery and ordnance material, with only $6,143,855 earmarked for new airplanes. The Army had asked for 496 planes to replace anticipated losses during 1942. But without following the priority suggested by the Department, the House approved 14 amphibians, 6 transports, and 37 advanced training planes, explaining that "if we are to forego for the present 2200 planes (under the new release policy), the Committee felt that procurement of practically all of the 496 might be deferred also just as well."

Money has previously been provided to procure aircraft up to the 5,500 authorized strength, all but 186 already under contract. The Air Corps now expects to have on hand by July 1, 1941, a total of 5091 operating aircraft, exclusive of 409 National Guard planes. Deliveries will begin to swing into high speed during the summer, with 772 planes coming through in 1940 and 2555 in 1941, according to present official estimates.

The appropriation bill also includes funds for continued expansion of military air bases, but omitted a $12,731,060 low-temperature experimental air base project at Anchorage, Alaska. Continuing economy pretenses—which the Senate is consistently knocking down—the House also cut heavily into the educational orders program.

Meanwhile, the House Naval Affairs Committee concluded plans for reorganizing the Navy Department, abolishing the currently vacant post of Assistant Secretary for Aeronautics, consolidating ship construction bureaus, and effecting other rather minor changes. Republican members, however, threaten a far wider readjustment if they come into power next year.

The turn of events abroad was immediately reflected in attitude as to appropriations for the Navy. The Senate Appropriations Committee, reporting the House-approved bill just after the Scandinavian invasion, increased contract authority for aircraft procurement from $10,000,000 to $25,000,000. The extra $15,000,000 was ear-marked one-third for replacement planes and two-thirds for planes to complement the new aircraft carrier, Hornet. Also, $2,000,000 set down by the House for experimentation was diverted to buy Hornet planes.

The Senate Committee, however, reduced the direct appropriation for airplanes, parts and accessories $5,000,000 below the House figure to $41,083,400.

But even before Congress had time finally to enact this appropriation bill, members were already discussing the probability that additional sums would be necessary to speed up Naval expansion in view of the new crisis overseas.

## The Skyrocket

It may be sort of funny looking, but Grumman's new Navy fighter is supposed to be the hottest thing on wings. The single-place two-engine Sky-

**The NEW GRUMMAN SKY ROCKET which has reports of being the fastest pursuit ship in the world. Also it appears to have been released for foreign purchasers. (See story).**

*Wide World*

**FLYING BLIND from Mitchell to Langley Field where he made an instrument landing, and then back to Mitchell Field, where he made a second blind landing with a Flying Fortress, Major Carl McDaniel brought new honors to the Air Corps on April 6. Here the crew is being greeted at Langley. L. to r.: Col. Jacob Wuest, Major General Delos Emmons, Major Harold George, Navigator Lieut. W. P. Ragsdale, Co-pilot Capt. W. A. Methany, and Major McDaniel.**

rocket is claimed to pack more h.p. per pound than anything yet built and to be faster even than Lockheed's P-38. Observers say that in test dogfights it flew rings around everything it came up against, and practically hung on its props in the climbs.

Grumman also claims its new baby can throw a greater volume of heavy gunfire than any comparable ship; rate of fire of its nose cannon is not restricted by having to fire through the propellor. An unusually large gas capacity gives it a range that permits bomber escort duty; the ship has racks near the wing tips for light bombs.

Intended to operate from aircraft carriers, the Skyrocket has square-tipped wings with a bow designed to prevent wingtip stall at low landing speeds. Power, in unspecified amounts, is furnished by air-cooled radial; Grumman thinks these are less vulnerable to gunfire than liquid-cooled jobs.

## Midget Special

The Curtiss-Wright P-40D you're reading about is a new name for the P-46. This is the ship the existence of which was presented as justification for export release of the P-40, back in the days when secrets were secrets. Now the P-40D has been released, but you still have to buy one to find out what it's like.

Reportedly it's much like the P-40 except that the engine has been jazzed up (with a new supercharger?) and the fuselage has been narrowed down a bit and the whole ship gone over so that any extra bumps have been cleaned off.

## New Air Corps Trainer

Latest in a long line of rugged North American trainers, the basic trainer, Model BT-14, is now under delivery to the Army Air Corps at Randolph Field. The BT-14 is a two-place tandem low wing monoplane with enclosed cockpits. It has stressed skin wing built in three sections, with integral fuel tanks. Fuselage is of steel tube structure to the rear cockpit, metal covered, and of metal monocoque structure aft of the rear cockpit. Landing gear is of fixed type. Power is supplied by a Pratt & Whitney engine carrying a two-bladed Hamilton Standard propeller.

## First Trip, Hood Down

The first all-instrument cross-country flight, all under the hood, was made by Maj. Carl B. McDaniel, Air Corps officer, on a 300-mile course from Mitchell Field, New York, to Langley Field, Va., on Army Day, April 6. Major McDaniel is a specialist in instrument and dead reckoning air navigation and has built up a distinguished record as a flyer.

His flight was made in a Boeing B-17 four-engined "flying fortress" bomber, powered with 2 Wright 1,000-hp. Cyclones. With him were two other officers, and four enlisted men, who were not under the hood, but they gave him no assistance whatever. The usual radio aid procedure was followed, using the directional beam, approach markers, and the glide and direction beams from portable blind landing equipment.

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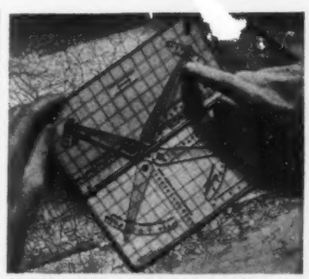
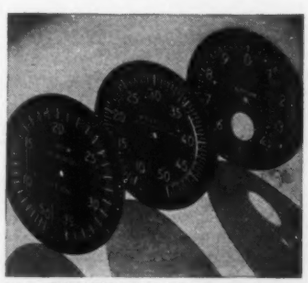


PERFORMANCE CALCULATOR designed of Graphic Lamicoid by Perry Graf Corp.



INSTRUMENT DIALS economically produced of Graphic or Translucent Lamicoid

OPERATING CHART of Graphic Lamicoid furnished with Pratt & Whitney Machines

# AVIATION ABROAD

## British Overseas Gets Start

British Overseas Airways Corp. officially took over all activities of both Imperial Airways and British Airways on April 1. On the Board of Governors, as announced by the Secretary of State for Air, are Mr. Clive Pearson, Chairman; Mr. Irvine Geddes, Deputy Chairman; Mr. Harold Brown; Mr. Gerard d'Erlanger; and Mr. W. L. Runciman, chief executive member and Director-General.

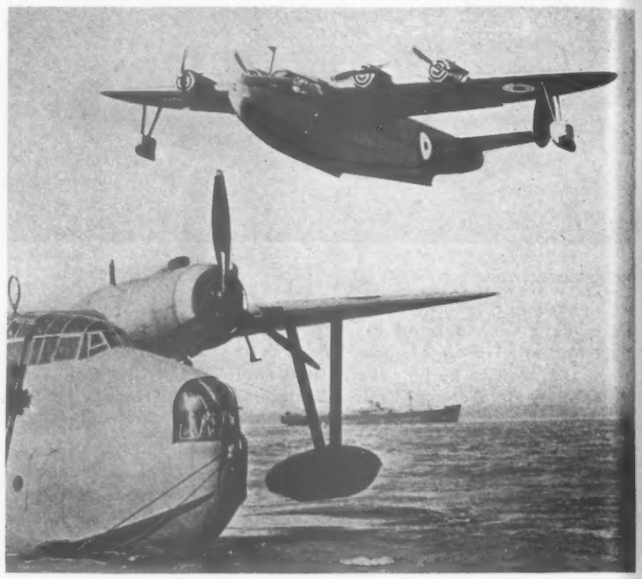
The new organization has eight departments, administration, finance, public relations, traffic, operations, service engineering, accounts, and technical development. In this country the Manager is Paul E. Bewshea, with offices at 620 Fifth Ave., N. Y. C.

Trans-Atlantic mail service from England to La Guardia Field, via Newfoundland and Canada, is expected to start about the end of May. The flying boats Cabot and Caribou, which were in this service last summer, will again be used.

The Airways Corporation is at present functioning on a special war time basis but it is to be hoped that passenger service across the Atlantic will be commenced some time this year, using 36-ton flying boats.

Under an arrangement with the British Government, the Airways Corporation at present operates National Air Communications for the Air Ministry. In addition, it provides two services weekly from the United Kingdom to Australia, four services weekly to India, once weekly to South Africa, twice weekly to Central Africa, once weekly to Hong Kong, once weekly to West Africa.

On some of the services American Lockheeds are used and quite recently extensive purchases have been made in the U. S. A. of Wright Cyclone engines which are to be fitted in some of the 40-seater airliners on various routes.

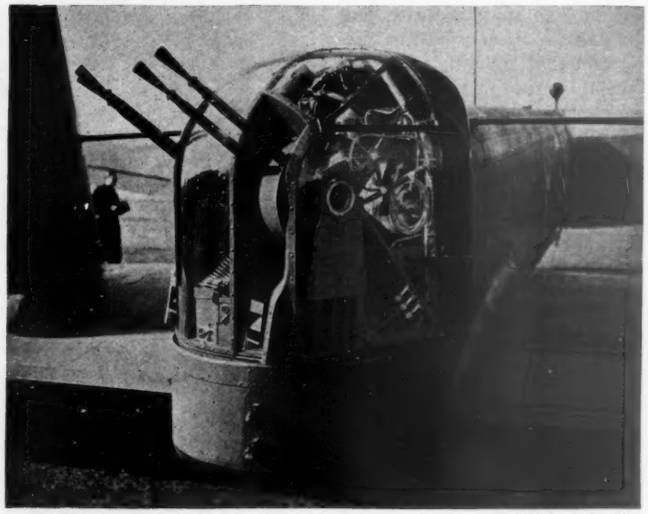


*Acme*

**SHIP IN THE AIR is a scale model with a 50 foot wingspan which type English plan to build in the future as giant flying boat for Atlantic passenger service.**

*International*

**THREE ARMSTRONG WHITWORTH WHITLEY heavy bombers, which Britain has been using continuously in recent weeks. Powered with two liquid-cooled 990 HP. Rolls-Royce engines these ships will do 245 m.p.h. Close-up of tail turret is shown below. Tail guns have proven to be extremely effective.**



*British Press Combine*

**TAIL GUNNER in an A. W. Whitley. To operate four guns, apparently of 30 caliber, gunner grips two handles. As he twists right or left, entire turret and gunner move from side to side. Turning handles up and down quickly change altitude of guns. Power is hydraulic. Belt cartridges show on left. Used shells slide down chute.**

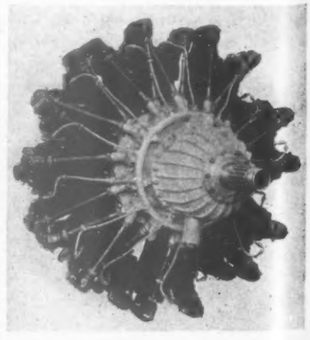
## Scandinavian Air Traffic

Before the recent outburst the only possible way to go from Scandinavia abroad by a regular means of communication has, for nearly two months, been to go by air. The boat connections to Denmark, Germany, Finland and Balticum have been suspended, as well as the steamers going from Bergen to Newcastle.

Traffic on the air lines has been very considerable. From Stockholm to the isle of Gotland ABA has been flying up to 4 trips every day. Generally flying on this route is done only in the summer for bathing guests. Traffic on the newly re-opened air service to Helsingfors is very heavy. Up to four services every day are flown from Stockholm to Helsingfors in addition to two services to Abo. More than 200 passengers are generally transported every day between Sweden and Finland.

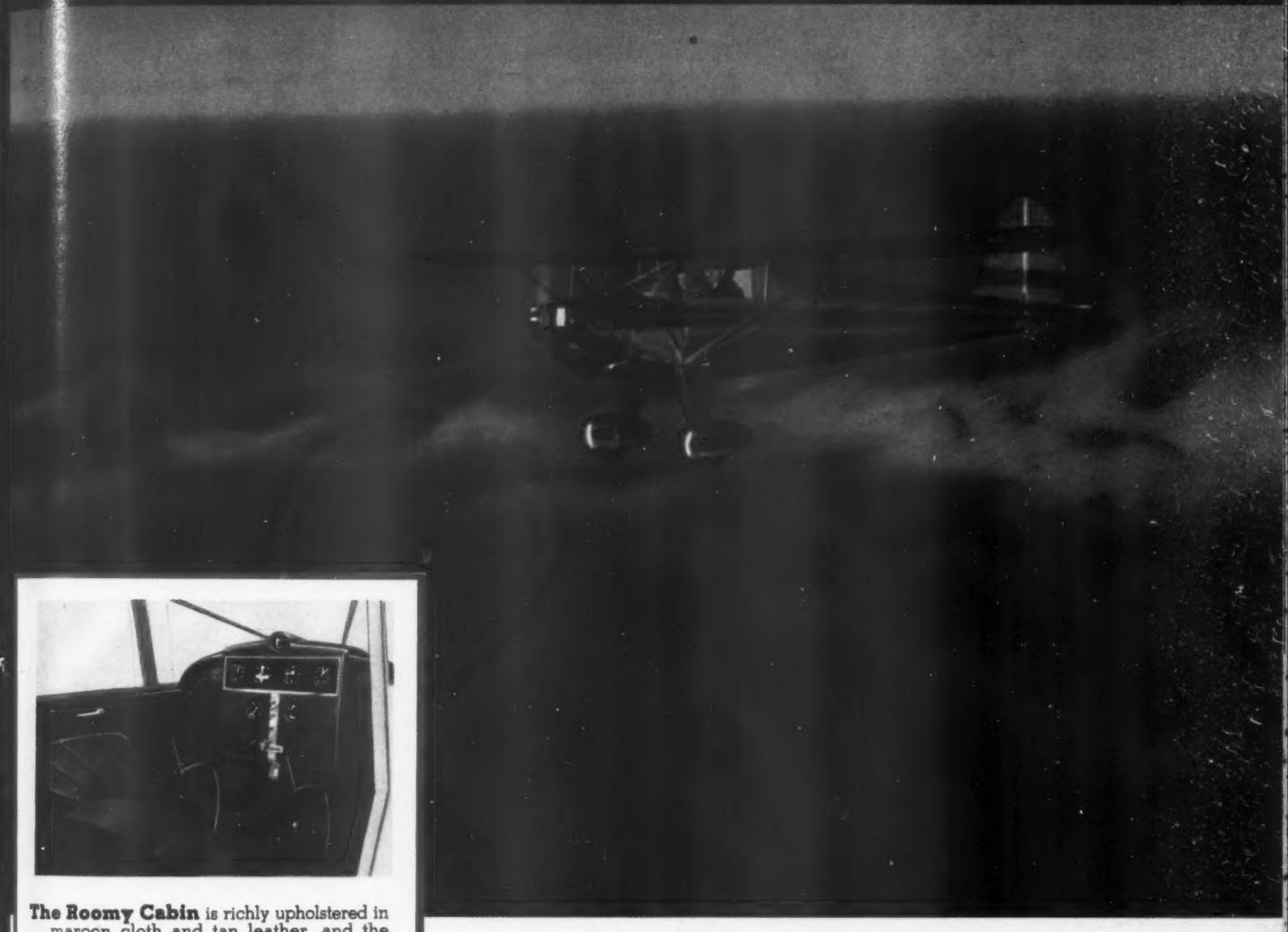
On April 1st Swedish ABA-Douglas DC 3 planes will again come to England. They will start in the morning from the Stockholm-Bromma airport and fly in one day to Shoreham. They are painted orange. Up to now the Swedish planes have stopped at Amsterdam.

On April 1st one of the two regular lines Stockholm-Abo-Helsingfors, flown by ABA and Finnish Aero, will also be extended to Tallinn in Estonia.



**A NEW FOURTEEN-CYLINDER, TWIN-ROW RADIAL ENGINE that produces 1,000 hp. has been announced by Industria Aeronautica Romana, of Brasov, Roumania. The engine is being used on the IAR-39 and IAR-80 airplanes, and is said to be in quantity production.**

# MODERN AS TOMORROW
# THE SILVAIRE BY LUSCOMBE





**The Roomy Cabin** is richly upholstered in maroon cloth and tan leather, and the graceful chromium trimmed instrument panel is fitted with glove compartments and ash trays, rivaling the appointments of highest priced automobiles.

## SILVAIRE STANDARD EQUIPMENT

Dual ignition Continental 75hp. fuel injection engine — wheelpants — modernistic striping — brakes — tailwheel — compass — chromium trimmed shock-mounted instrument panel — custom styled two-tone interior — glove compartments — ash trays — all standard instruments — and other items usually classed as "extras."

★ ★ ★

See Luscombes on display at these showrooms: — 247 Park Ave., New York City; 32 W. Hanover Street, Trenton, N. J.; 112 Glen Street, Glen Cove, N.Y.; 1018 North Meridian, Indianapolis, Ind.

Scarcely a moment after you open the throttle you are off the ground climbing at 1100 feet a minute in Luscombe's newest all-metal beauty of the skies. Leveling off with the nose well below the horizon, you cruise quietly and comfortably at 110 miles per hour.

The Silvaire is truly **different,** combining the performance, luxury and feel of a heavier ship with the economy and ease of handling of a light-plane. The most discriminating pilot need no longer pay high prices for refinement and high performance. In a class by itself, the all-metal **Silvaire** is **the sensation** of the year.

## LUSCOMBE "TRAINER" and "STANDARD"

The original all-metal all-purpose light airplanes, popular because of their great strength, performance, appearance and durability, continue as undisputed leaders in the low-price field. Powered by Continental 50 hp., 65 hp., and Lycoming 65 hp. engines, these well known models are priced from $1895 with down payment as low as $633.

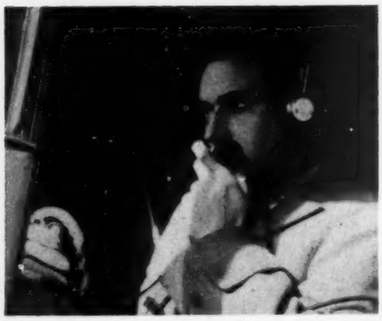
**For further information and a free demonstration, see your dealer or write Dept. C-4.**

# LUSCOMBE AIRPLANE CORPORATION, West Trenton, New Jersey

# TRIPLE SAFETY

## WITH THE NEW LEARADIO 3-WAY RADIO AMTRL-12

**SEE** your course on the azimuth scale of your AMRL-12 Direction Finder. Simply rotate the highly sensitive, shielded loop and receive its extremely well defined null. Then read the bearing on the azimuth scale and set your course. "Home" on *any* radio-range station, approaching it from *any* angle. Fly an accurate course without continuous beam-listening. No need for being lost at any time!



**SPEAK** with your AMT-12 Transmitter to any of the hundreds of ground stations all over the country and maintain invaluable two-way communication. Find out exactly *what* you want to know, exactly *when* you want to know it! A special dynamotor power-pack gives 10-watt operation and really remarkable range.

**HEAR** all radio-range stations and control towers on your high-performance AMR-12 Receiver. Fly the beam—get the weather—carry on two-way conversations—keep in touch with everything that concerns your welfare.

THE Learadio AMTRL-12 (Receiver-Transmitter—and Direction Finder) is more than just a radio communication system—it is a priceless form of property and personal insurance. It provides the conservative pilot with the three major forms of radio contact for the successful completion of every cross-country flight.

The AMTRL-12 was painstakingly engineered by Learadio to be light enough for the lightest of the light planes—to give performance enough for the fastest of the big planes. Built to meet all ATC requirements—priced to suit all budgets! See your Learadio dealer for further information or write directly to us.

**$377**

**and worth every cent of it! Includes receiver, transmitter, rotatable loop, and dynamotor power-pack. Total weight only 22½ pounds.**

**LEAR AVIA, INC.** DAYTON, OHIO—*Branch Offices: Roosevelt Field, Mineola, L. I., N. Y. · Los Angeles Municipal Airport (Hangar #5), Inglewood, Cal. · Beech Airport, Wichita, Kan. · Cable: Learavia, N. Y.*

## *"Trouble is, we need more power"*

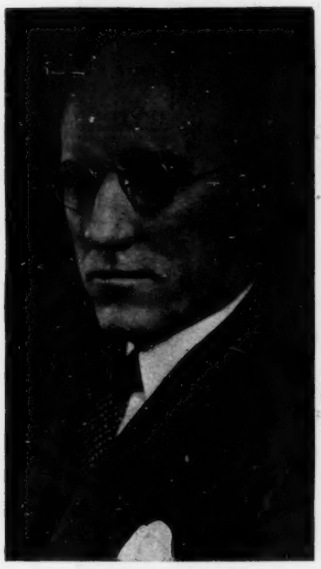
You can't touch any phase of aviation without finding yourself faced with the problem of power . . . and *more* power. Whether you are building a model or a mainliner, the more power you have, the farther and faster she'll fly.

That's why aviation engineers today are constantly working to develop greater power through fuel and engine improvements. And assisting them are the research engineers of the Ethyl Gasoline Corporation.

Files of data have already been secured. Some of this information is useful today. A great deal more will become increasingly valuable in the not too distant future. For it is this program of continuous research that will provide better fuels and engines for the flyer of tomorrow—the "aviator" who today is twisting a rubber band to make his plane fly.

*ETHYL GASOLINE CORPORATION, manufacturer of anti-knock fluids used by oil companies to improve gasoline*

# AVIATION PEOPLE



**ROBERT E. DOHERTY,** president of The Carnegie Institute of Technology, has been appointed a member of the National Advisory Committee for Aeronautics by President Roosevelt, to fill the vacancy left by the resignation of Brig. Gen. Walter G. Kilner, who was named a director of P.A.A.

**A FORMER ARMY FLIER** is Director of the newly organized Military Contracts Division of Republic Aviation Corporation. He is C. Hart Miller, with Republic since 1935 as Engineering Assistant to the President. Assistant Director of the new division is Mundy I. Peale, formerly with Sikorsky Aircraft.

**ROBERT J. SMITH** has been appointed a Vice-President of Braniff Airways, to succeed O. M. Mosier, now Vice-President of American Airlines. Smith, who was general traffic manager of American Airways from 1929 to 1932, will coordinate Braniff's flight, operations and maintenance departments.

**VETERAN TEST PILOT** Paul E. Hovgard has joined Glenn L. Martin Company as chief research engineer, under W. K. Ebel. An engineer, Hovgard designed the Dole Derby winner; tested ships for Keystone, Curtiss, Grumman and Loening; latterly was research engineer for Curtiss Wright in Buffalo.

**THREE MEN WHO CAME TO DINNER:** Ten years ago Elmer A. Sperry, Jr., of Sperry Products Co. and Sir Hubert Wilkins, arctic explorer, were passengers aboard the first passenger plane dispatched from the old North Beach Airport. The plane, a Ford tri-motor Eastern Air Transport ship, was piloted by Captain Erlon H. Parker. When Eastern Air Lines inaugurated its La Guardia Field service on April 1, they commemorated the event by dining at the airport with Captain E. V. Rickenbacker, Eastern's president, just before takeoff of the Mexico Flyer "Silversleeper." The "Silversleeper" leaves each evening at 7:15, arrives at Brownsville, Tex., at 8 a.m., transfers its passengers to a Pan American plane which brings them to Mexico City in time for lunch. A snack bar is available throughout the trip, with full meals served at meal times. L. to r., Captain Parker, Mr. Sperry, Sir Hubert, Captain Rickenbacker.

**A UNIQUE SERVICE,** that of analyzing and testing material used in airport construction, has been inaugurated by Haller Engineering Associates. Director of the Airport Consulting Division is Emil K. Harvey, long an airport consultant, and who for seven years taught airport design at the Guggenheim School.

# CURTISS-WRIGHT TRANSPORT

—AMERICA'S LARGEST TWIN-ENGINED AIRLINER

**MEMORANDA**

36 passengers
5200# Cargo
1500 mi. Range
over 240 m.p.h.

## with 2 Double-Row CYCLONE 14's

With the beginning of a new era of advanced development in air transportation, Curtiss-Wright introduces a commercial transport plane which embodies many features indicative of the constant refinement in aeronautical design. Two 1700 h.p. Wright Double-Row Cyclone 14's give the 36-passenger, 19 ton ship a top speed of more than 240 m.p.h., coupled with the simplicity and economy of operation of the Cyclone type.

Already well established in transoceanic service, the Wright Double-Row Cyclone 14 has borne out the Cyclone 9's reputation as the world's outstanding airline engine. The 1700 h.p. Wright Double-Row Cyclone, introduced with the Curtiss-Wright Transport, is a logical development of the original models of the type, which were brought out at 1500 h.p. in 1938, 1600 h.p. in 1939, and now with 1700 h.p. for the immediate future.

**WRIGHT AERONAUTICAL CORPORATION • *A Division of Curtiss-Wright Corporation* • PATERSON, NEW JERSEY**

**WRIGHT *Aircraft* ENGINES**

# AVIATION MANUFACTURING

## Real War Brings Orders

Washington (AVIATION BUREAU): Outbreak of active fighting in the Scandinavian theatre has thrown the dawdling export situation wide open. The allied purchasing commission, not having any use for airplanes at the moment and knowing that the longer it waited the better ships it would be able to buy, had not been pushing very hard on the necessary detailed negotiations with the War Department that followed announcement of the new liberal policy on release of high-test ships. Then, a day or two before Germans marched into Denmark, when it was becoming clear that something would break, the heat was really turned on, the negotiators got down to business, and the planes were released. It was then possible to talk turkey to the manufacturers on actual orders.

The "new" policy was not so much new as newly made public. Weeks before manufacturers had had the tip-off that they could safely negotiate sales of the still un-released models. And administration sources made it their business to prepare public sentiment by talking up the strength of the Germans and the needs of the Allies. One highly authoritative source let slip, "off the record," that Germany would soon be building 6,000 planes a month, while Britain could only make 1,200 and France 400. (An equally good authority, incidentally, thinks the Nazis will be doing mighty well if they turn out 2,000 a month.)

Further proof of the legislators' approval of this policy came in the virtual elimination of aircraft purchases from the Navy supply bill and in the defeat, 10-7, by the Senate Naval Affairs Committee of Senator Lodge's amendment requiring the Navy to spend all its airplane money within the coming fiscal year.

Prospects that the Allies will get fairly quick deliveries on their new orders are good. Production lines now rolling out planes for the U. S. can be switched over to export orders. The backlog of unfilled military export orders amounts to about 3,350 units, which won't take long to run off at present production rates. Of the 1,400 or so ships now being produced each month, about 300 are flivers, another 100 larger civil types, perhaps 200 are for our own armed forces (this will decrease in future), and the remaining 800 are for military export. Production is rising fast and is scheduled to reach about 2,500 a month by year end.

## Don't Let Mars Fool You

Hazards of the aircraft industry, from the investor's point of view, have not been removed by recent increases in aircraft backlogs, according to a report sent stockholders of Douglas Aircraft Company by Donald W. Douglas, president. Pointing out that rigid profit limitations are fixed by law on all planes sold to the United States Government, that increases in production costs have been brought about by recent rapid expansion, and that possible losses may occur through cancellation of foreign contracts, Douglas emphasized the effort of the Douglas Company to improve its future position through devoting engineering research to development of the commercial market. Douglas currently has a backlog of approximately $97,000,000, of which about $20,000,000 represents commercial business.

*Hans Groenhoff*

LUSCOMBE "SILVAIRE", newest of Luscombe's metal ships, has several improvements over earlier models. This is the deluxe job, with much fancy fittings and a 75 h.p. Continental.

## Nix on Freight Rates

Still worrying the engine people is the petition independently presented to the Interstate Commerce Commission by the New York, New Haven & Hartford Ry. Specifically aimed at Pratt & Whitney, this requests either a 70 per cent rate increase or reduction of liability between Hartford and Weehawken, N. J., embarkation point for shipments to Europe. The application is momentarily quiescent, and the shippers hope that in view of the action of the other lines, N. Y., N. H. & H. will quietly let it drop—but are keeping their powder dry for an ICC fight.

## Lockheed Business

While talk of huge military orders continues to dominate aviation gossip, the Lockheed Aircraft Corporation has announced receipt of approximately $615,000 in new commercial business during March. Included in this business were three new Lockheed 18s for Continental Airlines, two 18s for Air Afrique, one model 18 to a private customer and one model 12 to the U. S. Navy. To accommodate increasing business the Lockheed Corp. is rushing completion on two new assembly buildings at the Burbank plant, one costing $55,000 and the other $40,000.

## Recent Awards

### Navy Department

**United Aircraft Corp.**, East Hartford, Conn., $52,110 for blades and hubs for airplanes.

**Wright Aeronautical Corp.**, Paterson, N. J., $28,412 for aircraft engine.

**United Aircraft Corp.**, East Hartford, Conn., $245,569 for aircraft engines.

**Worthington Pump & Machinery Corp.**, Washington, D. C., $24,786 for air compressors.

**United Aircraft Corp.**, East Hartford, Conn., $696,881 for aircraft engines.

### War Department

**The E. A. Kinsey Co.**, Cincinnati, Ohio, $55,976 for universal horizontal shapers.

**Bausch & Lomb Optical Co.**, Rochester, N. Y., $112,350 for aerial navigation instruments.

**Westinghouse Electric & Manufacturing Co.**, Dayton, Ohio, $996,913 for power and control equipment.

**Bendix Aviation Corp.**, Bendix, N. J., $32,029 for starter assemblies, switches and solenoids.

**United Aircraft Corp.**, Hamilton Standard Propellers Div., East Hartford, Conn., $60,156 for propeller and control assemblies.

**General Electric Co.**, Schenectady, N. Y., $70,604 for maintenance parts for superchargers.

**Curtiss-Wright Corp.**, Clifton, N. J., $3,565,760 for propeller and blade assemblies and controls.

**Wright Aeronautical Corp.**, Paterson, N. J., $318,008 for maintenance parts for Wright Aeronautical engines.

**Ingersoll-Rand Co.**, Cincinnati, Ohio, $34,744 for air compressors.

**Taller & Cooper**, Jersey City, N. J., $166,042 for six-component balance for wind tunnel.

**Douglas Aircraft Co., Inc.**, Santa Monica, Calif., $115,000 for aircraft equipment.

SPERRY GYROSCOPE COMPANY'S NEW LOCKHEED—first twin-engine ship built exclusively for flight research purposes. Sperry engineers wrote specifications for many parts of the airplane. It will be used for instrument tests and developments, study of special navigational aids and vibration research.

## E. J. Parker Joins Howard Aircraft

Directors of Howard Aircraft Corporation of Chicago announced the election of E. J. Parker as president and treasurer of the corporation, to fill the vacancies left by Ben O. Howard and Damon Howard, both of whom recently resigned. Mr. Parker was formerly an executive with one of the Fisher Body units in Detroit.

## Switlik's New Factory

A formal inspection of the new Switlik Parachute & Equipment Company Building was held in Trenton, N. J. on Friday, April 12. The new building which was purchased by the company, makes available for immediate use over 50,000 square feet of floor space, with present production facilities for over 200 parachutes a week. It is now one of the largest parachute factories in the world, where 76% of both the United States Army and Navy parachutes are made, in addition to supplying a number of foreign governments.

**Belt-line production**—Piper's cub factory brought "Fordism" a step farther into commercial aircraft production when it introduced a monorail assembly system patterned after the auto factories, speeding up production 15 per cent in the process. After final welding, the bare fuselage is hung on the monorail and moves over 3,000 ft. of trackage equipped with switches, sidings and crossovers.

**AUTOMOBILE INJURIES** resulted in the death on April 9th of our contemporary, Robert J. Pritchard, for 14 years editor of Western Flying. Originally a newspaper man, Bob Pritchard switched to aviation in 1925, when he and V. L. Ehrenclou founded the Occidental Publishing Co. Except for a brief period in 1939, he had been editor of the magazine, and editorial director of the five trade magazines published by his company.

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**Sub-contracts**—Keeping busy on a $400,000 backlog of sub-contracts while it carries on flying windmill development for the Army, Kellett Autogiro has leased 16,000 sq.ft. of a four-story building near its Philadelphia Airport plant; provision is included for getting more space as needed.

**INTERESTED SPECTATORS** at the testing of Culver Aircraft Corporation's plastic bonded ship,—the Dart Model E. Bottom row: Kenneth Aldrich, CAA Inspector; George Stephens, CAA Engineer; M. P. Crews, Chief Midwest Branch; K. K. Culver, Jr., President. Top row: C. M. Jamieson, Assistant Engineer; M. Jakasky, CAA Engineer; Al. W. Mooney, Chief Engineer; H. G. Fitzgerald, Secretary; K. K. Culver, Sr., Treasurer.

**PNEUMATIC ROCK DRILLING**
*was the ground school for Elastic Stop Nuts*

Not until they were tried and proved in the most gruelling industrial service that could be found, were Elastic Stop Nuts offered for use on aircraft. That was back in 1927 when these nuts made good on rock drills and other pneumatic equipment, where the vibration is just about the most severe known in any field.

» Now, Stop Nuts are in their fourteenth year of successful use on aircraft . . . applied to major and secondary fastening jobs on every American military and transport plane, as well as on most foreign planes.

» And, to complete the cycle, general industry has recognized the record of Elastic Stop Nuts in the air by adopting them for all classes of equipment, from radios and washing machines to oil rigs and locomotives. Here, as on aircraft, they are promoting safety, speeding up production, and reducing maintenance costs.

A 56-page Catalog and Data Book contains a graphic explanation of the Elastic Stop principle, presents test and application data, and lists the complete line of nuts.
• *Write for a copy*

ELASTIC STOP NUT CORPORATION
1005 NEWARK AVENUE • ELIZABETH, NEW JERSEY

*THE NUTS WITH THE RESILIENT NON-METALLIC LOCKING COLLAR*

Elastic Stop SELF-LOCKING NUTS

*SECURITY IS THE WATCHWORD...*

● **In safeguarding and watching over the security of our nation, the United States Army Air Corps is dedicated to a program which will always guarantee and maintain the superiority of our Air Force. To give new and added striking power to Air Defense, the *Bell Airacobra* is now in production for the United States Army Air Corps.**

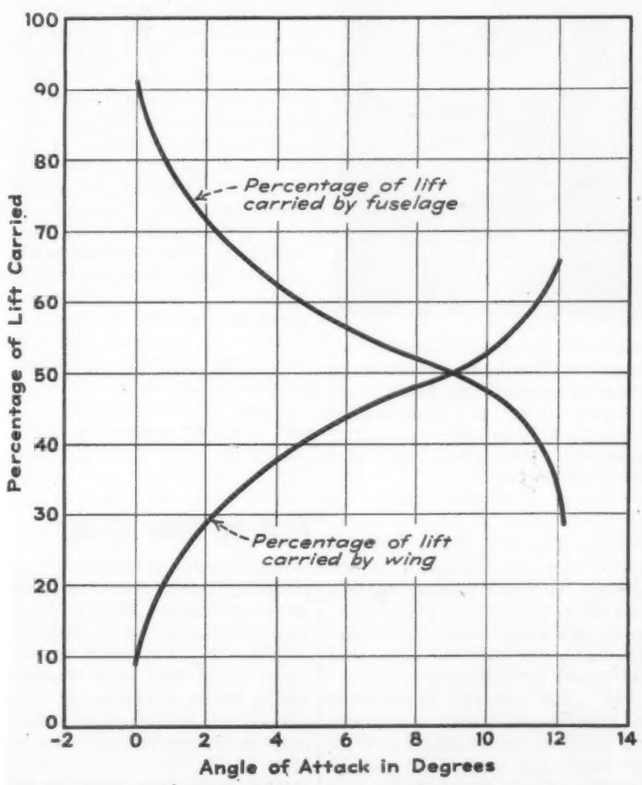
*BELL*
*AIRCRAFT CORPORATION*
*BUFFALO, N. Y., U. S. A.*
*"WINGS FOR THE COBRA"*

# AVIATION ENGINEERING

## Flying Wings Report

From the Guggenheim School of Aeronautics at New York University, as the result of testing a model submitted by the Burnelli Aircraft Company, come some very interesting results on the lift characteristics of fuselage sections built in the shape of airfoils. A nine foot model was tested, with wing panels on each side of the airfoil fuselage, at a critical Reynolds number of 580,000 and a speed of 59.4 m.p.h. to obtain the results (part of which are shown on the accompanying graph). This model was to 1/24 scale while on the full scale ship the lifting section of the fuselage would be 24 ft. long with a chord of 30 ft. The fuselage was a basic profile of the NACA .0012 type modified to a maximum thickness ratio at 32% of the fuselage chord.

One of the outstanding results was the percentage of lift carried by the fuselage as compared to that carried by the wing. At low angles of attack practically all of the lift was taken by the fuselage (see graph). At 9 degrees angle of attack the curves crossed and at higher angles of attack two thirds of the lift is carried by the wing. Also of interest was that tests with varying the angle between the outer wing panels and the fuselage showed that the most efficient combination was that at which the two were at zero angle to each other.




**THE LIFTING FUSELAGE of the Burnelli Aircraft Co. showed remarkable characteristics in the wind tunnel results.**

## Tunnel Tests Augmented

Following the practice he initiated in early tests with the Northrop "flying wing" which served as a flying test model of the famous Northrop Alpha, Beta, Gamma, Delta series, John K. Northrop is now planning man-carrying scale models of larger planes in order that free flight testing may be conducted before starting production on full-sized planes. Northrop now has under development a "family" of planes reported to incorporate a radical new basic design. No hint as to the nature of this design has been given, other than that it will apply to a series of planes ranging from small single-engine fighters to large multi-engine craft. Now in first stages of production in the Northrop factory are 24 conventional type monoplanes recently ordered by Norway. Meanwhile workmen are rushing to completion the first of Northrop's flying models, to be test flown within 60 days according to announcement. This is said to be one third size and is a scale model of a twin-engined military plane.

**HERE'S ONE hot off the old flivver. The Rudy Arnold "trap door" on the exhaust line is part of a new exhaust silencer that is attached along the bottom of the plane. Besides operating automatically in case of back-fire, it can be controlled by the pilot to be used as a "cut-out"—how's that for the racy ace.**

## Research Conference Off

The National Advisory Committee for Aeronautics is too busy researching to talk about it, especially with the new labs at Langley and Moffett fields. Hence, the annual aircraft engineering research conference has been postponed a year to May, 1941.

## Altitude Fuel System

At certain conditions at high altitudes, high test gasoline vaporizes and replaces liquid fuel in feed lines to the engines. It's not hard to see that these "vapor locks", as they are called, play havoc with efficient operation of the engine. For this reason Military planes had trouble in consistantly operating with the same degree of efficiency above 20,000 feet.

The Pump Engineering Service Corporation in Cleveland, in cooperation with the Army has developed a new fuel system that is aimed at eliminating these "vapor locks". The new system changes the placement of the fuel pump to a point remote from the engine and at a level more equal to that of the gas tank. The Result—although not officially released, military ships have been able to fly well above 20,000 feet with much improved operation.

## Standardizing In West

Dedicated to the establishment of standards of shape, size, weight, color, and composition of aircraft parts, accessories, and materials, the Western Aircraft Standards Committee has been organized to represent the standards engineers of all Pacific Coast aircraft plants. Edward J. Kasnicka, Lockheed standards engineer, is chairman of the committee. Hundred-degree countersunk head rivets are one of the standardizations effected by the committee to date. Heretofore plane companies have been using rivets varying from 80 to 120 deg. The committee also has standardized de-icer manifolds into four types and the engineers are now concentrating on such items as ventilating ducts, universal joints, screws, steel tubing sections, etc. An effort is also being made to arrange an identification code for colors on cable wrappings, and to get stainless steel for aircraft use in sheets of standard shape, size, and composition. Kasnicka will shortly make a trip to the East coast for a conference with standards engineers there.

## Automatic Warning Lights

An "electric eye" has been devised to control the familiar red warning lights at the New York Municipal Airport. When darkness or fog or haze thick enough to make flying dangerous is present the photoelectric cell automatically lights four red lights on a tower two miles from the field. In the morning or when the gloom passes, it will automatically turn the lights off.

A recording voltmeter will be connected in the relay circuit to record the on and off time of the lights. The relay makes use of one phototube and three standard metal vacuum radio-type tubes. Relays of this type have had their test run in street and highway lighting proving their reliability. The General Electric Company's lighting engineers were the ones who developed the idea which looks like a good one for relieving some of the responsibility of the already too busy man in the control tower.

# TRANSPORT AVIATION

## Airline Discount Battle

Washington (AVIATION BUREAU)—It will be a long time before you hear the last of the airline fare discount question on which the Civil Aeronautics Authority held hearings for several weeks. The two main points under discussion are the discount card, which is issued to business firms and to individuals who will place a deposit of about $400 with the airline that writes the card; and the 15 per cent discount allowed to federal employees.

The Authority has to decide whether these cuts are discriminatory against the ordinary air traveler. History in brief: In 1935, when there was no passenger rate control, American Airlines issued discount cards in large numbers as a smart competitive move. Other lines were forced to follow suit, because the cards actually constituted a rate cut to the main body of air travelers. United Air Lines for a while tried the credit contract, plan but later decided to abandon it.

The result is not entirely satisfactory to anybody but American. Many customers think they have to deal with the line that issued the card, and a few of them think they can use the card only on the line that issued it. So AA has the advantage. The system makes a lot of confused bookkeeping for *all* the lines. It makes trouble, too, for companies holding them; such as employees taking unauthorized rides.

The Authority can do one of several things. It might allow the airlines voluntarily to discontinue issuing cards, and let them be issued for all by the Air Transport Association, with modifications which would remedy minor troubles. It might possibly order the discount cards stopped entirely, on the ground it is discriminatory against the citizen who cannot afford to make the deposit. But the chances are it will recognize the discount for volume business as legitimate, following precedent in many other lines of selling.

Discount to the Government is a different problem. It isn't getting much business for the airlines. Federal travelers are afraid to take the air, because if they don't prove that per diem and salaried time were saved as a result of the air trip the Comptroller General disallows the extra airline cost, and it's not recoverable. When the new civil air law opened the way for government travel, the lines excitedly prepared for a sell-out, but President Roosevelt immediately ordered federal agency heads to scrutinize every trip, with the result that the smoking-cars, and not the skies, are darkened by bureaucrats.

If CAA regards G-travelers as individuals, then the discount to them is discrimination. But if they are regarded as employees of an organization, then they are entitled to it as a concession to volume.

**PROMOTION comes to Edward Sullivan, heretofore chief of stations for Pennsylvania-Central Airlines, who has been appointed the line's General Traffic Manager by Vice-President J. J. O'Donovan. With the company since 1935, he has been District Traffic Manager in Washington, Cleveland, and Pittsburgh.**

*Wide World*

**WORLD'S FAIR visitors will soon come flocking in to the seaplane terminal at La Guardia Field where Pan American Clippers sail in and out. By the end of May it is expected that British mail planes will also be using these facilities.**

**MOVING UP from Eastern Manager for TWA to assistant to the chairman of the Board, I. S. (Stick) Randall will now enlarge his activities to cover the entire country. His office will continue to be NYC.**

## Safety Council Meeting

Ways in which private flying can be made safer occupied most of the first session of the Safety Council's aeronautical section at the New York meeting on April 17. Gill Robb Wilson was chairman and Grove Webster the lead-off speaker. Earl Ward and Fred Smith also represented CAA. In a discussion about airport controls for private flyers, David Little, Bill Lear, Roger Wolfe Kahn, Laurence Sharples, Jim Guthrie, Douglas Langstaff and Charles L. Morris were speakers.

At the afternoon session dealing with transport problems, T. P. Wright gave an illustrated talk, "Aviation Today and Tomorrow" and S. Paul Johnston gave an interesting presentation of recent developments in research that have increased safety in flight.

## Route Rejections Tough

CAA has a lot of route applications pending and on the law of averages that's going to mean a lot of rejections. That each one is going to empty vials of wrath over the authority is indicated in the repercussions from the examiners rejection of the Great Falls, Mont., to Lethbridge route into Canada.

No satisfactory proof was presented, found the examiner, that there would be enough traffic to justify the line. Say local proponents, "So what." It's the only connection to Canada in 1,600 miles, and if the applicants failed to prove there would be traffic or that national defense is involved, the CAA should have hunted around and proved it for them.

Meanwhile plenty of local heat is being turned on the authority to reverse its examiner.

## Pick-up Bids Called

All American Aviation's application for a CAA certificate of convenience and necessity was filed December 21, 1939, but because the Authority has not acted on it, and says it cannot act in the near future, the Post Office was compelled to call for bids on the system, to be opened May 10.

The Post Office call for bids requires bidders to have a suitable and safe pick-up-and-drop

## AIR TRANSPORT INDICATOR

April 1, 1940

**164.25**

Which is the ratio of passenger-miles reported by the Air Transport Association for all domestic lines for March, 1940, to the figure for March, 1939. Total for the Indicator has decreased slightly over the last month but still remains far ahead of last year. For the first three months of 1940 traffic stood at 181,564,289, revenue passenger miles—up 64.2 per cent.

See Finance page for individual companies' traffic figures.

gadget. Several such are said to exist, beside the one developed by Dr. Lyle S. Adams and now in use by Du Pont. But any bidder must face the fact that if successful his contract would be cancelled by the PO when CAA awards a certificate. No one but Du Pont has applied to CAA for it. Odds would be heavy against any new-come applicant.

## Pan American's Plans

PAA is still waiting to start its San Francisco-Los Angeles-New Zealand run. CAA has not yet decided whether to OK the Los Angeles jump-off. The company wants it badly as a good source of traffic to Honolulu, which would be a way point. Daily runs to Hawaii would be an early possibility. High-speed high - altitude four - engined planes will be used. Long ago PAA agreed to share possible daily service through joint ownership with the Matson steamship line, but that matter is up to CAA now.

PAA has gone back to its summer route: direct to Lisbon via the Azores. One of the big Boeings has been put on the Bermuda run, with 60 seats to handle spring business.

The company has filed applications for two more routes southward: one from New Orleans direct across the Gulf of Mexico to Guatemala via Merida, Mexico; and one from Los Angeles to Mexico City.

Orders soon will be issued to Douglas for the first three of a fleet of DC-4s for Pan American-Grace Airways' South American west-coast-and-trans-Andean line to Buenos Aires, which will be within 48 hours of the United States when things get going.

## Nix—Freight Rate Rise

Representing a significant step in airline rate history, United Air Lines on April 10, inaugurated a 25 per cent reduction in Los Angeles-San Francisco fares over their Coast route. The move was made following authorization by the CAA and covers schedules served with the older Boeing 247 type transports which make a number of stops en route. Regular schedules are flown non-stop with Douglas DC-3 equipment. The new low fare averages 2⅞ cents per mile and will be tried for a period of six months. It is thought that travel to the 1940 San Francisco Exposition will be stimulated materially over this route as a result of this fare concession.

## Airline Doings

**American Airlines** awaits CAA action on its application to operate from Dallas-Fort Worth and El Paso to Mexico City. Eastern section of proposed route would be via Eagle Pass, Texas, and Monterrey, Mexico. Monterrey would have air service for the first time, if route is approved. Ordered four Douglas DC-3s, two 14-passenger DC-3 skysleepers, and 15 forty-passenger DC-4's for delivery early in 1941.

**TWA, Inc.,** seeks a route from Amarillo, Tex., to Dallas, Fort Worth and Houston, via Lubbock, Abilene, and into Austin. Jack Frye, president, says if application is approved, TWA will schedule direct service from Texas to Pacific Coast. TWA also seeks a direct route between San Francisco and Los Angeles, another between Pittsburgh and Boston, and between Kansas City and Denver. To serve Washington for first time directly from San Francisco, Amarillo, Tex., and the Grand Canyon, TWA proposes another new air route. Stops en route would be at Evansville, Ind., Louisville, Ky., Cincinnati, and Parkersburg.

**Braniff's** growing pains also include a Washington service. The line would establish a route from Kansas City to the capitol city, via Jefferson City, St. Louis, Evansville, Louisville, Lexington. Service on the route for which CAA blessing is sought would be operated entirely with Douglas DC-3's. Company also seeks the proposed Denver-Laredo, Tex. route, via Colorado Springs, Pueblo, Amarillo, Lubbock, Big Spring, San Angelo and San Antonio, with a correlated route from Lubbock to Abilene, Austin and Houston.

**Curtiss-Wright Specification 3300 Calls for AMPCO METAL 18-23**

SEVERE and exhaustive tests proved that Ampco Metal 18–23 would easily withstand *twice* the recommended torque applied to "set home" the hub attaching nuts on Curtiss Electric Propellers.

Ampco Metal 18–23 met every test without galling, seizing, or deforming beyond gauge limits. In recognition of its remarkable aviation quality, Curtiss-Wright Specification 3300 was written around this unusual Ampco alloy.

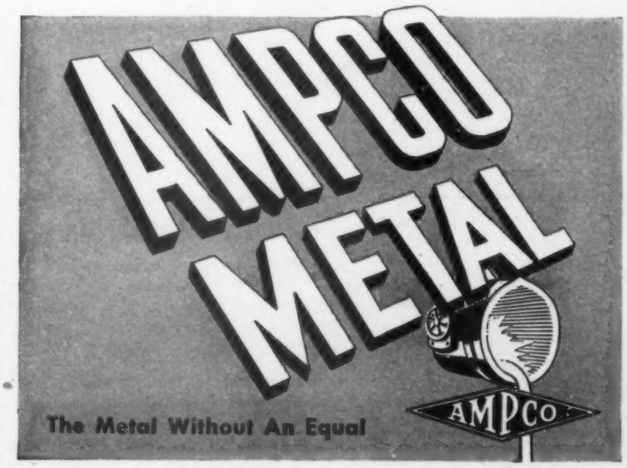
Approved and accepted by the manufacturer and Federal Authorities, Ampco 18–23 is being used as standard on all new Curtiss-Wright Propellers delivered for Army, Navy and Commercial, replacing the heat-treated alloy steel previously used for these parts.

For information concerning Ampco 18–23, write for Engineering Data Sheet No. 74 for February, 1940.

**AMPCO METAL, INC.**

Dept. A-540

Milwaukee, Wisconsin



# AVIATION FINANCE

*Spotlight in aviation financial circles is held by the proposed Curtiss-Wright-Atlas Corp. merger as stockholders prepare to vote on the plan. Airline companies enjoy record first quarter traffic and earnings, while aircraft manufacturers rush production on business scheduled for delivery this year, and garner large orders for 1941 shipment.*

**Curtiss-Wright-Atlas Corp. proposed merger,** will come to a decision late this spring when stockholders vote on the plan. It has been strongly intimated that Curtiss-Wright directors would give consideration to common dividend payments upon approval of the merger.

**Domestic airlines** handled a record volume of traffic in March, exceeding that of last October, the best previous month. Eastern Air Lines was principally responsible for the new high record. Traffic over the EAL system is usually at a seasonal peak in March.

**Braniff** and a number of other airlines—but none of the transcontinental units—enjoyed record March travel. Profitwise, the March gains enabled the air transports as a whole to break about even in the first quarter. At the end of February the domestic airlines had a two months' deficit of around $300,000, as compared with a loss of $780,000 last year. In 1939 the industry was not in the black until April.

**Douglas Aircraft** completed delivery of its first French war order in February. Shipments that month were around $5,000,000, may rise to a monthly peak of $7,000,000 this summer. Large scale commercial and military deliveries from orders now on the books will extend well into 1941.

**Aluminum Company of America** plans to double the capacity of its Los Angeles plant at a cost of $2,000,000. This expansion is a direct result of increased demand from aircraft industry.

**Lockheed** produced 356 planes in 1939, compared with 99 the previous year. Output in the first quarter this year averaged 25 planes monthly, somewhat under the best rate reached last year. With unfilled orders at record levels, production will be speeded up as fast as engines are available.

**Registration of 230,000 shares** of Solar Aircraft Company $1 par value stock for trading on the Los Angeles Stock Exchange became effective April 13. Concurrently, Edmund T. Price, president, issued a statement calling attention to the growth of Solar from gross sales of $158,462 for 1938, to $533,647 for the fiscal year ended April 30, 1939; and to $461,148 for the six months ending Nov. 11, 1939. Backlog is currently about $1,250,000 and current deliveries are at the rate of more than $100,000 per month.

**Beech Aircraft** delivered sales were $932,000 for the six months ended March 31, 1940, up from $261,000 a year ago. Beech is doubling present plant capacity to 30 planes monthly.

**Piper Aircraft** unfilled orders were above 600 planes in April. Installation of an overhead line slowed up output in the first four months this year.

**Bendix Aviation** sales increased approximately 6% in the first quarter of 1940. At the same time new orders approximated shipments and unfilled orders currently stand about $37,000,000, a gain of $25,000,000 in the past nine months. A dividend of 50¢ has been declared payable June 1.

Sales of **Interstate Aircraft and Engineering Corp.** for the first ten months of the current fiscal year were $245,373, up 117% from a year ago, according to Don P. Smith, president. Backlog April 1 stood at $230,000, an increase of 234% from the previous year while net profits were $24,694, as against a $31,345 net loss.

**Micromatic Hone Co.** earnings for the first quarter amounted to around 48¢ a share, as against 12¢ a year ago. Application will be made shortly to list the stock on the N. Y. Curb Exchange. Some 35% of current sales is for aircraft precision products and incoming orders are in excess of shipments.

**Northrop Aircraft** with a backlog already above $2,350,000 as a result of a parts order from Consolidated, and an order for 24 monoplane seaplane bombers from Norway, expects to have about 1200 employees by June.

Braniff's recent stock issue was oversubscribed the first day of offering . . . Vultee Aircraft unfilled orders were $14,960,000 on March 1, as compared with $915,000 a year ago . . . Trans-Canada Air Lines reported a deficit of $411,656 for 1939, expects a profit this year . . . Eastern Air Lines set an all-time passenger record March 21, by carrying 1,218 passengers that day . . . Eaton Mfg. Co is increasing productive capacity of the aircraft engine valve plant at Battle Creek, Michigan . . . Curtiss-Wright had $36,491,000 in advances on sales contracts on January 1, and United Aircraft had similar advances of $26,461,000. Most of these cash balances related to foreign war orders . . . Ryan Aeronautical unfilled orders recently totaled approximately $1,680,000 . . . Dow Chemical is increasing output at the Midland, Michigan plant 50% through construction of a $500,000 rolling mill to produce Dowmetal . . . Fairchild Engine & Airplane has plant expansion under consideration . . . Lockheed received $615,000 in new commercial business in March . . . Martin first quarter sales estimated at around $9,000,000 . . . Solar Aircraft has received the second largest order in its history ($150,000) from the Martin Co. for military plane parts.

## Current Earnings Reports

| Company | Period | Net income— 1939 | 1938 | Common share earnings 1939 | 1938 | Sales 1939 | 1938 | Back-log 1940 | 1939 |
|---|---|---|---|---|---|---|---|---|---|
| Aviation Corp | Yr. Nov. 30 | d 2,238,000 | 187,900 | d | 0.07 | 3,301,000 | 6,373,000 | 4,464,000 | 419,000 |
| Bendix | " Dec. 31 | 4,485,000 | 156,048 | 2.14 | 0.07 | 41,726,000 | 30,893,000 | 37,000,000 | ..... |
| Boeing | " " | d 3,284,000 | d 554,900 | .... | .... | 11,846,100 | 2,000,000 | 23,002,000 | 14,894,000 |
| Braniff Airways | " " | 43,824 | 28,765 | 0.58 | 0.38 | 1,749,299 | 1,395,144 | ..... | ..... |
| Breeze Corp | " " | 177,126 | 135,367 | 0.55 | 0.43 | ..... | ..... | ..... | ..... |
| Brewster | " " | 9,976 | 233,878 | 0.02 | 0.66 | ..... | ..... | 17,856,000 | 2,002,000 |
| Bullard | " " | 286,000 | d 22,171 | 1.04 | .... | 3,566,746 | 2,985,411 | 5,425,000 | 529,000 |
| Curtiss-Wright | " " | 5,218,258 | 3,598,738 | 0.39 | 0.17 | 48,654,142 | 33,102,962 | 144,930,000 | 31,546,000 |
| Douglas Aircraft | " Nov. 30 | 2,884,000 | 2,147,392 | 4.81 | 3.76 | 27,866,000 | 28,347,000 | 97,287,000 | 22,500,000 |
| Fairchild Av | " Dec. 31 | 422,740 | 322,473 | 1.25 | 0.95 | 2,003,116 | 2,195,816 | 2,161,000 | 1,070,000 |
| Fairchild Eng | " " | 187,694 | d 185,229 | 0.19 | .... | 1,343,019 | 702,247 | 1,876,000 | 200,000 |
| Grumman | " " | 892,063 | 617,074 | 1.85 | 1.30 | 4,478,889 | 4,904,946 | 6,000,000 | 3,500,000 |
| Lockheed | " " | 3,132,918 | 442,111 | 4.04 | 0.67 | 35,308,000 | 10,274,500 | 57,350,000 | 33,300,000 |
| G. L. Martin | " " | 4,110,605 | 2,349,355 | 3.75 | 2.15 | 24,169,000 | 12,417,000 | 49,241,000 | 13,903,000 |
| No. Amer. Aviation | " " | 7,088,000 | 1,904,000 | 2.06 | 0.55 | 27,608,000 | 10,062,000 | 50,559,000 | 10,914,500 |
| Penn. Central | " " | 53,318 | d 20,868 | .20 | .... | 1,857,493 | 1,450,594 | ..... | ..... |
| Sperry | " " 31 | 5,462,060 | 4,916,000 | 2.71 | 2.46 | ..... | ..... | ..... | ..... |
| United Air Lines | " " | 322,121 | 997,221 | 0.21 | .... | 12,287,000 | 9,925,000 | ..... | ..... |

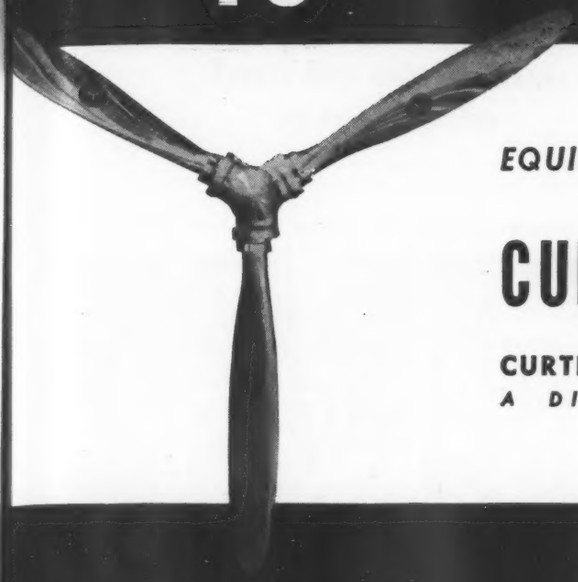
d — deficit.

## With the Airlines

| Company | Revenue Passenger Miles* March 1940 | March 1939 | % Gain | 3 Months 1940 | 3 Months 1939 | % Gain | Revenue Passengers March 1940 | March 1939 | % Gain | 3 Months 1940 | 3 Months 1939 | % Gain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| American | 21,257 | 12,337 | 72 | 54,147 | 31,910 | 61 | 54,840 | 30,208 | 81 | 139,516 | 76,121 | 83 |
| Braniff | 2,831 | 1,452 | 95 | 6,589 | 3,749 | 76 | 8,719 | 4,720 | 85 | 20,245 | 11,917 | 66 |
| Chicago & Southern | 907 | 577 | 50 | 2,159 | 1,442 | 50 | 2,256 | 1,397 | 62 | 5,395 | 3,504 | 54 |
| Eastern | 16,000 | 10,419 | 59 | 41,000 | 26,324 | 56 | 28,000 | 19,300 | 45 | 71,600 | 47,425 | 51 |
| Northwest | 2,814 | 1,438 | 96 | 7,501 | 3,592 | 108 | ..... | ..... | ..... | ..... | ..... | ..... |
| Penna Central | 2,438 | 1,496 | 69 | 5,639 | 3,428 | 65 | 13,233 | 7,922 | 67 | 31,000 | 19,200 | 61 |
| T. W. A. | 9,200 | 6,007 | 53 | 22,330 | 13,763 | 62 | ..... | ..... | ..... | a 27,924 | ..... | .... |
| United | 13,300 | 8,689 | 53 | 32,423 | 20,443 | 59 | ..... | ..... | ..... | a 38,184 | ..... | .... |
| Western Air | 1,072 | 580 | 84 | 1,443 | ..... | ..... | ..... | ..... | ..... | a 5,377 | ..... | .... |

* (000-omitted). a — 2 months — current figures subject to final adjustment.

# 15 FT. CURTISS ELECTRICS



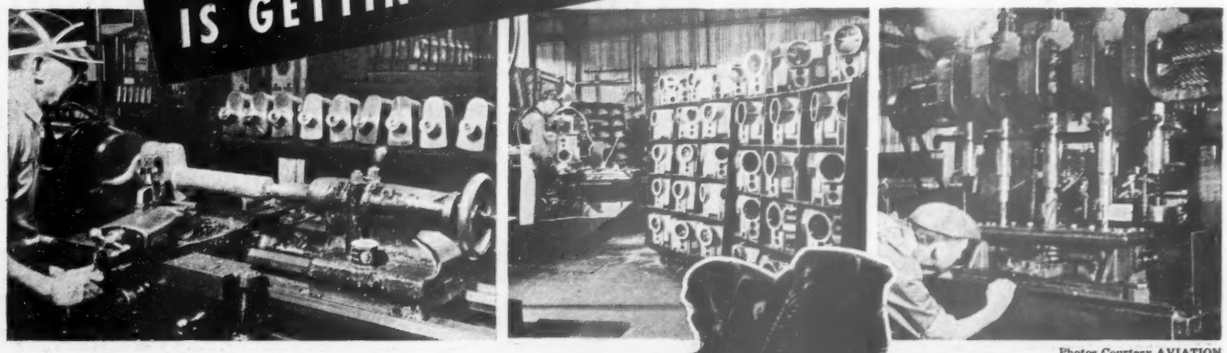
*EQUIP AMERICA'S LARGEST TWIN-ENGINED AIRLINER*
*—THE NEW 36 PASSENGER*

## CURTISS-WRIGHT TRANSPORT

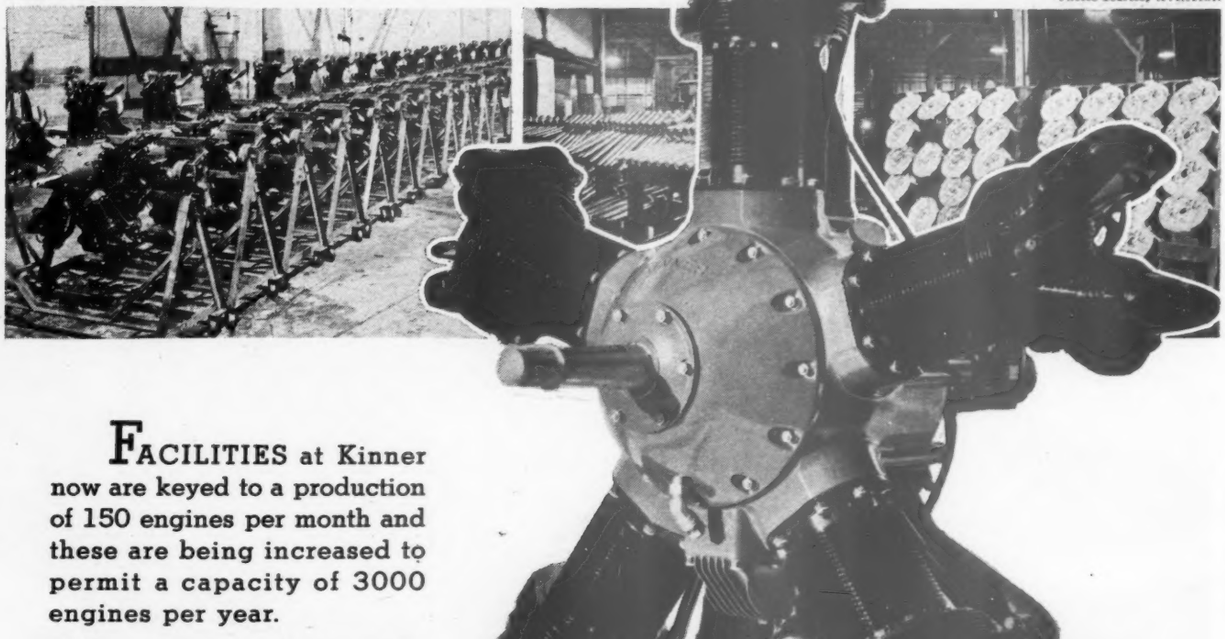
**CURTISS PROPELLER DIVISION, CLIFTON, NEW JERSEY**
*A DIVISION OF CURTISS-WRIGHT CORPORATION*

CURTISS *Electric* PROPELLERS

# KINNER PRODUCTION IS GETTING RESULTS



Photos Courtesy AVIATION





**FACILITIES** at Kinner now are keyed to a production of 150 engines per month and these are being increased to permit a capacity of 3000 engines per year.

With ample reserve for additional orders, Kinner is meeting all delivery schedules on both domestic and foreign orders, including the volume deliveries of Kinner Engines to Canada under the British Commonwealth Air Training Scheme.

**100 H. P. 125 H. P. 160 H. P.**

**KINNER MOTORS, Inc., GLENDALE, CALIF., U. S. A.**

# PROFIT & LOSS

## Trusts Buy Aviation Stocks

### By Raymond Hoadley

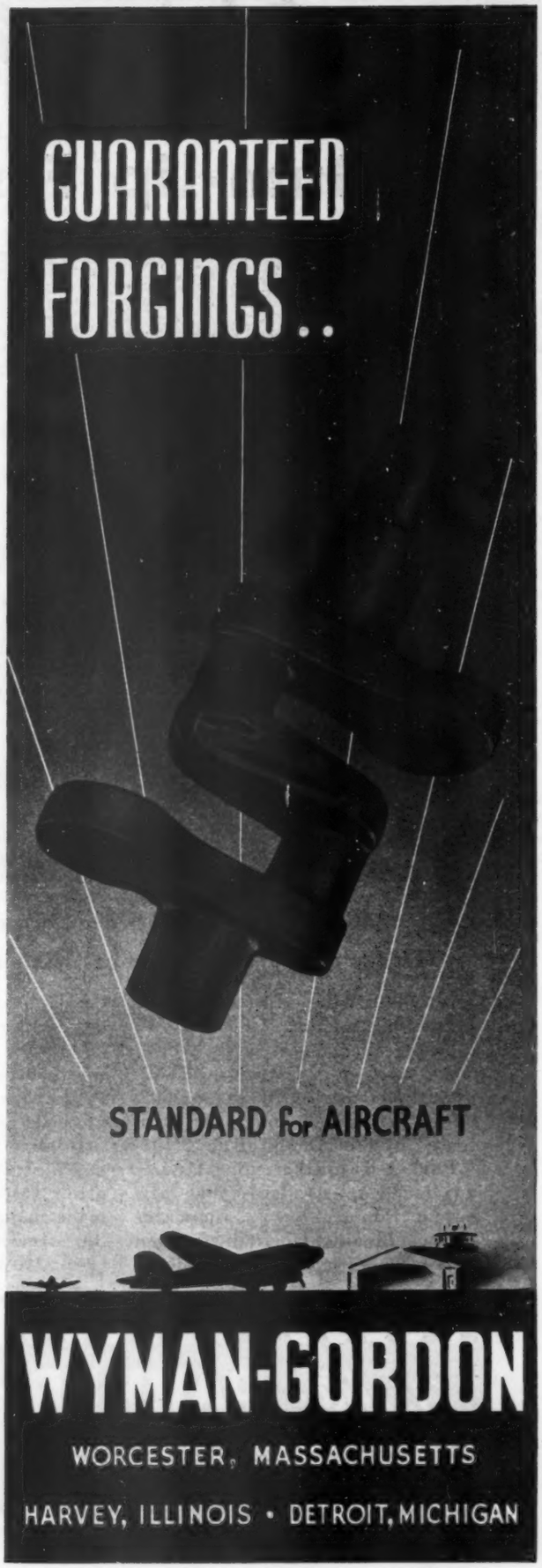
*Mr. Hoadley will be very glad to answer inquiries regarding the financial outlook of listed aviation companies*

**Aviation stocks are coming into pronounced favor** with the investment trusts as well as with the average investor. This is borne out by the eleventh annual survey of stocks held by 78 investment trusts made by the brokerage firm of Frazier Jelke & Co. According to the survey these concerns greatly increased their share holdings in the aviation field in 1939 along with heavier purchases in the steel, automobile and chemical industries. These gains were made at the expense of the building, rubber and amusement industries as holdings in those groups declined. As a result of phenomenal growth and attractive current outlook, aviation since 1936 has come up from nineteenth to thirteenth position among the industries in which investment groups place their funds. The number of Douglas Aircraft shares held by these trusts increased 172 per cent last year, Martin 75 per cent, Lockheed 63 per cent and United Aircraft 28 per cent. Of special significance is the increasing preference on the part of these institutional investors for air transport stocks. American Air Lines and Eastern Air Lines appeared in the survey for the first time in 1939 while heavier commitments were made in Pan American Airways and United Air Lines.

**In this investment "popularity contest"** United Aircraft Corp. led all other aviation stocks by a rather wide margin, appearing in the portfolios of 35 trusts. In fact, United tied Bethlehem Steel at the 1939 year-end for sixteenth place among the most favored of all industrial stocks. (Kennecott Copper, found in 56 investment lists, was the all-industry favorite.) The Martin Company was the second most popular aviation issue, having representation in the investment folders of nineteen trusts. Closely following in popularity were Douglas, Pan American Airways, United Air Lines, Eastern Air Lines, Curtiss-Wright A stock, Lockheed, American Airlines, Consolidated Aircraft, North American Aviation, National Aviation, TWA and Boeing.

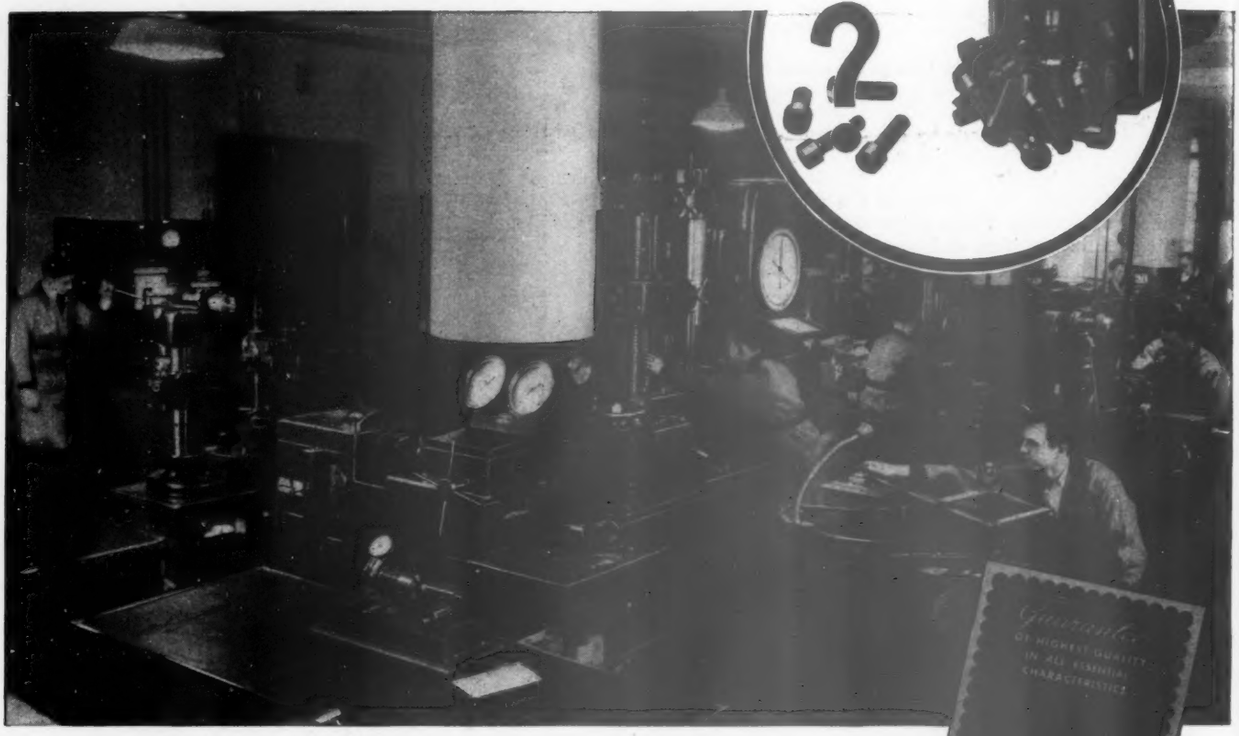
**As the largest aviation financial deal** that has been proposed since 1929, the Curtiss-Wright-Atlas Co. merger is a main topic of conversation in Wall Street. Interest centers around the $36,500,000 cash "kitty" that Curtiss-Wright would receive from Atlas on consummation of the plan. There has been gossip that C-W plans to buy up some accessory and machine tool companies—become the Henry Ford of aviation. It appears more likely that the money would be used to retire new preferred stock that would be exchanged under the proposal for present Atlas preferred and Curtiss-Wright class A stock. This would achieve in a roundabout way the capital set-up—only common stock outstanding—that Curtiss directors have sought for years. It would give Curtiss-Wright a capital structure more in keeping with that of other aircraft companies and more suitable for an industry which has consistently shunned the pyramiding of large issues of senior stocks and funded debt ahead of the common stock.

**First quarter earnings of the aircraft companies** were only a preview of the higher profits expected later this year. Shipments in some cases like Lockheed and Martin were lower than in late 1939 although well above a year ago. Recent difficulties in securing engines will be eased shortly when the impetus of the engine companies' expansion programs begins to be felt. Meanwhile accessory companies like Bendix and Thompson Products are likely to report the largest relative lift in first quarter earning power due to gains in both their aviation and automotive divisions.

# NO *Doubtful Few*

## To "Gum-Up" Fastening Jobs



### . . . When Parker-Kalon's Quality-Control Laboratory guarantees fastening devices

EVEN a few imperfect screws in a box can "gum-up" assembly work . . . waste time, boost costs, fail to make satisfactory fastenings. That's why thousands of plants specify Parker-Kalon and avoid all troubles caused by the "Doubtful Few."

Parker-Kalon Fastening Devices are made to standards that permit no "Doubtful Few" . . . standards that could only be attained when Parker-Kalon established a $250,000 Quality-Control Laboratory. Without counterpart in the industry, this laboratory applies a unique scientific control-routine to insure that Parker-Kalon Fastening Devices always work right and hold tight.

It pays to buy Hardened Self-tapping Screws, Socket Screws and other fastening devices that are made in the most modern plant in the screw industry. Parker-Kalon Corp., 190-196 Varick St., New York.

COSTS NO MORE to get
this Parker-Kalon Quality-Control
Guarantee with every box of . . . .
Hardened Self-tapping Screws
Types, sizes, head-styles for every assembly of metal or plastics
Cold-forged Socket Screws
Cap Screws, Set Screws, Stripper Bolts made to a new high standard of quality
Wing Nuts-Cap Nuts-Thumb Screws
Cold-forged . . Neater, Stronger

***SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS***

*Quality-Controlled* **PARKER-KALON Fastening Devices**

# AVIATION OPERATORS CORNER

## 10,000 Cash Customers

This summer there will be 10,000 new pilots looking for a place to fly. Most of them will have money to rent airplanes. Operators who want their share of this new business should spend the month of May getting ready for it.

Approximately 5,000 of the pilots trained by CAA live in the same general vicinity where they learned to fly, and presumably they will continue their flying with the same operator. Needless to say, any operator who has had a group of CAA students should do everything he can to hold on to his boys. And don't let anyone fool you that these youngsters won't keep on flying! About 70 per cent of last spring's class kept up their flying.

The other 5,000 college boys have been attending school away from home. Many of them may live in your community and when they come home in June they are going to start looking for a place to fly. In "Don't Give Up the Ship," in this issue we have urged the new pilots to keep up their flying. It is up to you to let them know you are ready for business and that you want their trade.

They have had 35 hours or more of excellent instruction and you can trust them with your ships. But they are used to flying in clean airplanes that are well maintained. So wash off the mud, and make sure your ships are kept tuned up.

The boys are all going to want to try their wings at cross-country flying. They can pay for it, but they can't pay too much. Don't kill the goose that lays the golden eggs by charging too much.

You usually have to spend money to make money. Last month we suggested an advertising service by Norman Warren that costs $5 a month for four advertisements. Whether you use his ads, or your own, it may pay you to do some advertising to attract your share of the new business this summer.

**Southwest Airmotive Company** is the new name of the former Booth-Henning organization at Love Field, Dallas. The firm will no longer handle airplane sales, but will concentrate on service and repair. It holds every class of CAA rating for repairing ships.

**Mel Nuss tells us** that the Reading, Pa., airport is being groomed for big things this spring. The town hopes that TWA will soon be using the airport regularly. Lighting equipment is being installed and runways are being lengthened.

**Chicagoland Glider Council** was active throughout the winter and has extensive plans for its spring program. Over 10,000 spectators came out to see the soaring show at Elmhurst Airport in February. About 30 pilots flew the seven sailplanes.

**Fort Wayne, Ind.,** Aero Club announces its Fifth Annual Air Show for Sunday, July 21. Last year over 35,000 persons saw the show. Now that Cleveland has given up the Races, Fort Wayne plans the biggest attraction of the Mid-West. Bob Schott will direct. The Club has a membership of 185.

**Toronto, Canada,** is proud of its new airport which was recently finished. The city converted a barren waste of sand on Toronto Bay into a splendid 178 acre field. The airport has two 3,000-ft. runways that are hard-surfaced and an additional 3,000-ft. grass runway plus several taxi strips.

A 160x120 hangar and a splendid administration building have just been finished. A completely equipped seaplane base is also new. Pilots using the Field can get to the business section of the city within ten to fifteen minutes by using a cable ferry installed for airport use.

**Bowlus Sailplanes** continues to make news, this time with its attractive folder describing the ABC of Soaring and a pictorial presentation of how its sailplane is put together from the Bowlus kit.

**Operators looking for additional** college business—and the profits from college-boy flying will definitely increase in the next few years—might study the success of the University of Southern California Flying Team which competes in one or two tournaments each month. College flying clubs, in which ships will be bought or rented from local operators, is a worth-while feature for all operators near college towns.

**Timm Aircraft Corp.** has sold its repair division, located on Grand Central Air Terminal, Glendale, to W. D. Timm, who has resigned as secretary-treasurer of the corporation to devote all of his time to the rapidly expanding repair business.

Originally established by W. D. and Otto W. Timm some six years ago, this repair business was the nucleus around which the present Timm Aircraft Corp. was formed. R. W. Moore, comptroller and formerly assistant secretary of Timm Aircraft Corp., succeeds to the position vacated by W. D. Timm.

**Michigan airports** are getting ready for the light plane tour that will travel up through the state the last week in June. Col. Floyd Evans, State Director of Aviation, expects at least 200 airplanes from Southern and Eastern states. Traverse City will be northern terminal. There will be no alligators, but you can count on some of the best fishing the country offers.

**Birmingham Air Carnival** will be held June 1 and 2. This is the tenth affair and Steadham Acker insists it will be the best. Throwing modesty to the winds, Birmingham says its carnival is the largest air show in the world, and they may be right at that.

## TRAINING
### Of Air School

**Spartan School at Tulsa** is booming these days, with nearly 400 students in the various departments. About 160 Flying Cadets and some 75 Air Corps mechanics are at the school, with new Cadets arriving every six weeks.

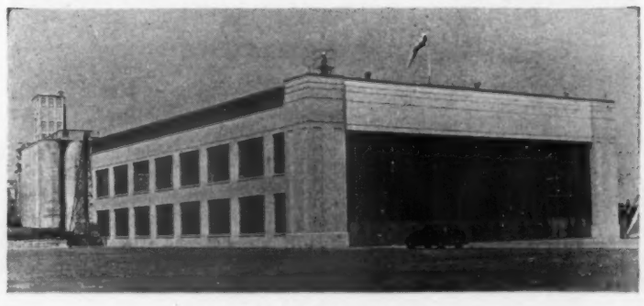
New equipment at the school includes a Weidenhoff Electrical Testing Unit, a new brick building for class purposes, and additional equipment for the engine, instrument and metal shops. One building is set aside for the study of fuels, oils and carburetion. The school is directed by Capt. Maxwell W. Balfour.

**Prof. Wm. A. Wheatley** has been appointed United Air Lines' Director of School and College Relations. With many years behind him of experience in public school and educational work, Professor Wheatley will build good will for United with the schools and colleges of the country. His office will be in Chicago but he will spend much time traveling up and down the lines.

**More schools should follow** the example of Herbert Hartley of the American School of Aircraft Instruments of Glendale, Cal. Not being content to get the real facts about what the industry wanted in instrument repairmen from just his own neighborhood, Mr. Hartley has taken a swing around the entire country, calling on airlines, overhaul bases and factories. His training course will be closely geared to what industry is looking for.

**Delgado Trades School** in New Orleans was given nineteen airplane engines and considerable other equipment for its aviation course by the Army recently. The aviation course covers three years and has about 400 students enrolled.

**Rising Sun School** of Aeronautics in Philadelphia placed 38 graduates last month. New school equipment includes a 1,050 hp.



New Hangar at Toronto

Wasp, two Lycoming 65s, and two Continentals. Four Taylorcraft fuselages were brought in for rigging and welding work.

Omaha, Neb., has such a successful ground school run by the Junior Chamber of Commerce that a second and more advanced course has been organized. The first course ran once a week for six weeks and attracted 1,500 persons.

**Students out at the Ryan School** in San Diego got a lot of fun out of watching the new Ryan Dragonfly, that was described in our last issue. One flying cadet at the school expressed his bewilderment this way:

"I was coming in for a landing and the first thing I knew I passed under some shade that shouldn't have been there. I looked up and saw the Dragonfly about a thousand feet above me but I knew he couldn't get into the field from as high as he was, so I came on in and landed. When I looked back after landing, there was the Dragonfly sitting on the ground about 200 yards behind me; and, by the time I had taxied back to the line the "Dragonfly" was floating around again at 1,000 feet!"

**Boeing School** of Aeronautics placed 250 students with 58 different firms. The school will expand its facilities this summer when it will take over space vacated by United Air Lines, which is moving from Oakland to San Francisco. Several Boeing students have recently gone to Cheyenne to begin work at the main U.A.L. base under the new apprentice plan.

**Due to increased number** of students, both space and equipment have been increased at the Luscombe School of Aeronautics at West Trenton, N. J. Several new engines have been installed including a Continental with fuel injection. New propeller and shop equipment has also been added.

**When an aviation school runs an airline**—that's news: And yet the advanced students of Parks Air College have been doing it every spring for six years. Round trip scheduled flights carrying "passengers, mail and express" are made from the home airport at East St. Louis to Chicago, Indianapolis, Memphis and Kansas City.

All procedures closely follow regular airline practice and provide excellent experience for students who will later go into airline work.

**The latest addition** to the equipment used by the Alabama Institute of Aeronautics to instruct the advanced C.A.A. students from the University of Alabama is the new Meyers biplane. The Meyers with a 125-hp. Warner engine is a two-placed biplane with metal covered fuselage and fabric covered wings. The advanced course consists of from 35–50 hours of flight instruction in the Meyers and 144 hours of ground school work. The students taking the advanced course have to have first secured their license from the basic C.A.A. course. The prime purpose of the Meyers is to instruct the students in acrobatics and advanced instrument flying.

**Although aircraft factories** of Los Angeles County are already employing more than 25,000 workers, and are adding to this total steadily, they have acted to stem the tide of hopeful youths who have rushed to Southern California from all parts of the country only to be stranded without jobs in all too many cases. Frequently these young men have come to California in response to sales solicitation by "mushroom" aviation schools, of which dozens have sprung up during the recent boom. To meet this situation the personnel managers of Southern California aircraft plants recently cautioned boys against these mushroom schools.

*Faber*

**Meyers Trainer Used at Alabama**

# JERRY SAYS

By JEROME LEDERER

**Fire extinguisher** Ordinarily the one quart Fire Extinguisher in most conventional airplanes is held in its bracket by side and end clamps. Care should be taken that the extinguisher is properly placed in the bracket and the clamp secure. If the extinguisher should become loosened by the seat, by clothes, shoes, by the parachute or just by climbing in and out of the airplane it will usually fall upon the floor and may jam the controls. If this happens when making a landing or takeoff or in violent maneuvers, it may result in a crackup. A new type of fastener has a band around the extinguisher with a quick opening device which appears to be very good and should be used.

**Hot air at LaGuardia airport** The seven hangars at LaGuardia Field encompass 33,000,000 cubic feet. Each hangar could accommodate a full sized football field with plenty of room for spectators. From floor to bottom of trusses is 42 feet. Doors 160 feet long and 40 feet high open to the full sweep of cold winds from the bay.

Despite the tremendous problem of heating this hangar space, a temperature of 55° F is maintained in the hangar, 65° F in adjacent shops and 70° F in the offices. When hangar doors are opened and then closed at an outside temperature of 30° F, the hangar can be heated to the desired temperature in 10 minutes. Warm air discharged at the floor line and returned to the heater room also at the floor line, gives a minimum difference of temperature between floor and ceiling. Actual readings show a temperature difference of only 5° between floor and ceiling.

Thirty 3,150,000 BTU per hour hot air units furnish the heat. The air being heated is always under positive pressure while the gases in the combustion chamber are always under a slight negative pressure. This means that the products of combustion can never pollute the air stream.

**More landing fields** Among the good by-products of the Civil Aeronautics Authority's Pilot Training Program is the establishment of more landing areas (not airports). The students must fly over a triangular 50 mile course landing at approved fields. In many sections of the country these fields were non-existent until recently when the program forced them through. We already have 2,300 landing areas or airports. Few people realize that the addition of only about 1,200 inexpensive landing fields would enable a pilot to be within ten minutes of a safe place to get down at any time, assuming a cruising speed of only 80 miles per hour. Florida, Michigan and Nebraska have landing field programs under way. Lets hope other states will follow. More landing fields make the pilot less dependent on weather, gives him more places to go, increases the utility of airplanes.

**Door locks** With airplanes being parked out in the open on a larger scale than ever before, it is important to have good doors and door locks to prevent pilferage of valuable equipment. One point to watch in these door locks is that water cannot get into them and soak the inside of the door especially if there is sound proofing or trim material in it. This increases the weight of the ship and is likely to cause corrosion. It is recommended that drain holes be placed at the bottom of the doors to let the water run out. On transport ships, most of the water enters through he door locks. On private ships it may enter through the windows.

**"I wanna play, too"** "In connection with candidates not physically qualified for flight training, the Base at Philadelphia reports an unusual instance. One candidate appeared for physical examination and his eyesight was such that if he looked anywhere but ahead he *saw double*. The commanding officer commented that the student could not be accepted. However, he would be in position to fly formation with himself in the Link Trainer."

# SO YOU *fly* YOUR OWN!

If you belong to the growing host of those who own and fly light planes, here's a tip:

When you buy your next ship, notice how many of the parts are made of Alcoa Aluminum Alloys.

In each place where Aluminum is used, the manufacturer has taken particular pains to give you trouble-free reliability.

Aluminum construction brings you those same advantages which are required by major airlines in the "All-Aluminum" aircraft which they operate. You get lightness which improves performance, and strength which adds to safety. You get resistance to corrosion which lightens the burden of upkeep. The aircraft alloys of Alcoa Aluminum used in your ship are produced with the same special care which is given Aluminum prepared for building military and government-owned aircraft.

In current models of well-known light planes, the following parts are frequently made of Alcoa Aluminum: *In the plane:* wing spars, wing ribs, fuselage covering, wing struts, wheels, trim, gasoline and oil tanks, and fittings. *In the engine:* cylinder heads, pistons, crankcase, and oil and gas lines. The propeller blades for many models are machined from Aluminum alloy forgings.

That list gives the most important parts for *this* year's models. Next year, the list will be longer—because these popular aircraft are getting better and better. ALUMINUM COMPANY OF AMERICA, 2182 Gulf Building, Pittsburgh, Pa.

ALCOA ALUMINUM

STAINLESS STEEL
& ALUMINUM ALLOY
SURFACES
& PARTS
HYDRAULIC
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CONCENTRATED specialization in Aircraft Engineering and Fabrication, including the latest development in hydraulic equipment.
Fleetwings dependable production schedules, made possible by the most advanced precision machinery and skilled craftsman, is a reliable source of supply for the aviation industry.
FLEETWINGS HYDRAULIC SELECTOR VALVES
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# WHAT I SAY....

## A well-known private pilot presents the views of his fellow flyers.

**We took delivery** recently of a new Stinson '105'. The weather had been bad for several days and they were still test-hopping the ship when we arrived. After a rigging check flight, the pilot made a series of careful approaches and landings and then taxied in with a note for the mechanics. Upon inquiry we learned he was making "landing tests".

That was a new one to us. What did one test for on landings? It turned out that accurate observations were made of the necessary back-stick movement to make a three point landing under the most nose heavy condition. With that known, an elevator stop is riveted in place, and henceforth the ship can never be brought up to a full stall from approach or climbing speed. It's an old trick, but it is refreshing to see the factory doing it on all airplanes—and definitely, as the ladies say.

We understand the restricted elevator and the built-in slots are considered to contribute about equally to the '105's' excellent stall resistant characteristics. This brings us right to the old problem of cause and effect. The C.A.A. favors stall resistant airplanes. They also require spins for license qualification. The problem is theirs. Which is it to be? Must the '105' owner hire another, and less safe airplane than he wishes to fly in, just to prove for license test that he can get out of a maneuver he will never get in?

**We were sitting** in the back end of a DC-3 as it came into a small but thriving city in the middle south. About the time the wing came up to completely obliterate our view ahead, the pilot suddenly steamed off and went around for another approach and a lovely landing. During the brief loading stop we asked the pilot what had happened. "Oh", he growled, "a blankety blank Cub was just off the runway and pointed away from me. I didn't know whether he was going to take off or not."

That was certainly good judgment, but just to draw the pilot out, we observed mildly, "Yeah, I suppose you airlines will soon have to build your own right of way like the railroads, and make your own airports all down through here". If we had hit him with a ball bat he could not have been more astonished. With plenty of heat, he came right back, "This is a municipal airport. The city seems to want us here badly. If those blame private ships don't get out of our way, they'll have to run *them* off to other fields."

We looked around. There were six of them moving around on the ground or within sight in the air, and knowing that there were only four airline schedules in *and* out of the airport each day, we wondered if a downright vote wouldn't show the citizens preponderately in favor of devoting their airport to private flying. That would be a ridiculous situation, so instead we lead with another thought.

"We don't see that your problem is with the private fliers. They are in the same boat you are when it comes to traffic, and they want to keep out of your way fully as much as you want them to. Seems to us that if the airport manager just took the trouble to drive out and wave red and green flags a few minutes before you are due in, that everyone would be happier and safer. Looks to us as if your quarrel was with the manager and you ought to get him to do something about it."

That great big pilot—representative of the best elements we have in flying today—looked just as astonished as he had a few minutes before. "Gosh", he said thoughtfully, "I never thought of that!"

**There are many enterprising airlines** and airports down through Central America, but best of them all are the splendid facilities of Pan American Airways. We presume a private pilot wandering down through there is nothing but an annoyance to them, but you'd never know it. On a recent trip to South America through the land airports of the Central American republics and back by way of the sea bases of the West Indies—we were flying an amphibian—we were the most grateful guest of the finest flying outfit in the world. From the time George Kraigher took us in hand in Brownsville until we taxied up the ramp at Dinner Key, we were made to feel at home and our way was marvelously smoothed for us.

Pan American charges are not low—quite the opposite—but the service is incomparable. Without our thinking of it, our plane was supplied with a box of regulation Panair chewing gum and drinking cups. At San Jose we stepped off the hotel elevator at six on a Sunday morning. A Panair station manager was already there to tell us that our tail wheel tire had gone flat over night and should they replace it for us while we were at breakfast? Without exception every detail to make our trip pleasant was anticipated and provided for. It was private flying at its best.

**A friend of ours,** landing his Beach at a large terminal airport, stopped to watch a DC-3, just fresh from a complete overhaul, taxi out for its first subsequent check-hop. The tired chief mechanic, an ex-Army sergeant, who had worked overtime many nights to complete the job on schedule, leaned wearily against the hangar door and lit a cigarette.

The great ship wheeled into position. Inside, the pilot locked the tail-wheel and requested the assistant, riding for the test-hop as co-pilot, to release the landing gear safety-latch. Being new to that job, he not only released the latch, but also tripped the landing gear raise lever. Slowly the big ship lurched to the right, first crumpling that wing while the prop went to work on the concrete, then settling to the left creating equal havoc on that side. The noise stopped. The dust settled. The ex-Army sergeant disgustedly spat on the apron, and ejaculated with all the vehemence of a curse, "Scuttled, by God".

**For a hundred dollars** you can buy a marvelous little black box for your ship. It has a minimum of knobs and gadgets, and you can talk through it as far as you need to when flying. You have to take a test for license to operate it. One of the questions asked is what you should do if you suspect it isn't operating satisfactorily. The right answer, and the only one they will accept is, "Turn it off and get a radio technician to look at it".

If that precept is known and understood, it seems to us that all the folderol about licensing you and licensing it—at least for the itinerant aircraft frequencies—is entirely unnecessary. Right now, the Federal Communications Commission looks on your little black box just as they do on WGY and KDKA, or the transmission of the Arlington Time Signals. You even have to file the complete corporation details of your company to get the right to use it.

**AT THE CHICAGO SPORTSMAN SHOW this attractive Taylorcraft was exhibited. Equipped with a 65 HP Lycoming, and given a special hand-rubbed finish, the ship caused much favorable comment. It was furnished by the Fox Valley Flying Service of Aurora, Ill.**

## Take to The Water

(*Continued from page 34*)

built and the operator has a crowd of from 5,000 to 10,000 people to draw from. At Austin, Texas, Harry Hammil, Beechcraft distributor, is busy these days from his seaplane base operation. At Hot Springs, Ark., Paul Miller flies Cubs from the river. In New Orleans the Chapman Air Service flies Aeroncas on floats.

The East Coast has dozens of seaplane operators, only a few of whom can be mentioned. One of the oldest is the Winnepesaukee Air Service of New Hampshire, founded by Bob Fogg, who is now the Seaplane Facilities Expert of CAA and who is the man to ask for help or advice concerning seaplane bases. The seaplane service he founded is now in its nineteenth year, and has flown some 60,000 passengers without an accident of any kind. Jack MacManus also has a well established base on Lake Winnepesaukee. Guy Ham has had a charter service for five years at West Falmouth, Mass. In Boston, Robert Love has a school and charter service and demonstrates Stinsons, Aeroncas and Fleets. Another successful Boston operator is E. H. Wiggens, who puts some of his ships on floats in the summer and takes them to Naples, Me.

Another operator who shifts his base twice a year is H. L. Redfield of Syracuse. In summers he goes up to the Thousand Islands and in the winter he takes a Waco to Winter Haven, Fla. Thanks largely to CAA, Florida has over 30 new seaplane floats and another dozen will probably be built. Florida is a "natural" for water flying. In Miami, Embry Riddle is doing a fine business. He has a class of CAA college students from the University of Miami that is learning seaplane flying.

One of the Atlantic states' best known operators is Glenn T. Clark of Charleston, W. Va. You would hardly expect to find a successful seaplane base in the heart of the Blue Ridge Mountains, but there it is. Clark used to fly from the airport 10 miles out of town but decided to move in where the people were. So he bought an old barge and built a hangar on one end at a cost of $700. Since 1932 he has expanded several times. Being on the water front, he gets lots of visitors so he built a restaurant for them, also put in an out-board motor boat business and other attractions which pay him well.

Under State Director "Les" Morris, Connecticut is putting on an active seaplane base program. By July ten bases will have been built. The state pays the $150 for lumber and material and NYA boys do the work. Later, if the individual towns show the right spirit and responsibility, the state will turn over the bases to them but at present the state maintains and operates them.

The area around New York City, with its miles of rivers, bays and inlets is attracting more seaplane pilots every year. In the past two years, four operators have established successful seaplane bases in one area in Ridgefield Park, N. J., a few miles west of the 125th Street Hudson River ferry. Although all are within 3,000 ft. of each other, no one complains about competition.

Bill Mellor and John Howard, both commercial pilots with instructor's ratings, operate the A.F.A. Seaplane Base on Overpeck Creek. They have a J-3 Cub and a Waco three-place open ship, and have a new Cub 65 on order. In the past year they took 650 passengers for rides and gave about 250 hours of dual instruction. They soloed 47 students and have about 68 active students now. They expect to solo at least 125 students this year.

Tony Barone, W. Gaito and R. P. Hahn operate the North American Flying Service at Little Ferry, N. J. From their base on the Hackensack River they operate two Aeroncas. Last year they soloed 39 students and took 470 passengers for rides. They now have about 60 active students. They are building a new hangar and have plans to buy two new ships.

The Modern School of Aviation, also on the Hackensack River, operated by Garofalo, Kohn, Zoeller and

(*Turn to page 97*)

**Cyak Air Service ramp, Cordova, Alaska.**

**The Milwaukee Seadrome has a landing field in front of the hangar and a seaplane base behind it, and thus both land and water pilots are satisfied.**

# Let's BUY

## A TAYLORCRAFT TOO---AND GET MORE FUN OUT OF LIFE

Why envy other people who are enjoying the thrilling sport and pleasure of flying a plane of their own? You, too, can get lots more fun out of life. For, today, it's so easy to learn to fly—and really inexpensive. The new 1940 Taylorcraft actually costs less than a cent a mile to fly—and flying this modern low-priced ship is even less difficult than driving an automobile. Learn all the facts about owning a Taylorcraft right now. Write us for complete information and we'll arrange a demonstration flight for you. You'll discover a new world of exciting enjoyment and, in Taylorcraft, a ship that will give you surprisingly more in flyability, comfort, safety and value.

**SEND FOR BROCHURE**

The new 1940 Taylorcraft is available in 65-60-55 and 50 H. P. DeLuxe models and the new Trainer with modern side-by-side seating and interchangeable wheel or stick controls.

**$1495 and up F.A.F. Alliance**

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## AMERICA'S MOST MODERN LOW-PRICED AIRPLANE *for 1940*

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**TAYLORCRAFT AVIATION CORPORATION**

DEPT. 55 ALLIANCE, OHIO

# RCA Announces a *New* *Lightweight* AVIATION RADIO COMBINATION

and Introduces the

# AVR-20 Aircraft Receiver

HERE are three RCA Aircraft Radio units which offer many advantages, either in combination or separately. Model AVR-15 Receiver—200 to 400 KC Radiobeacon-Weather reports and traffic control; Model AVR-20 Receiver—2300 to 6700 KC high frequency communication channel; AVT-15 Transmitter—2300 to 6700 KC transmission from plane to ground for traffic control, for weather information, for position reports or for plane-to-plane communication.

The flexibility of this installation is of particular interest for private, scheduled airline and military applications.

The small size of these receivers permits installation on the aircraft instrument panel within easy reach of pilot or operator. Each unit is carefully shock mounted and requires only four mounting holes. A complete two-way installation operates from the transmitter power unit. Where reception only is desired, the Model AVA-51 B or C power unit may be used to supply one or two receivers. Each unit has been designed for aircraft service and has been type certificated by the Civil Aeronautics Authority.

The combination of the AVR-15 and AVR-20 Aircraft Receivers with the AVT-15 Transmitter covers all present aircraft radio services and represents the ideal two-way radio telephone for your airplane.

For dependability, use RCA Radiotrons. All prices f.o.b. Camden, New Jersey, subject to change without notice. See these outstanding receivers and transmitters at your nearest Air Associates Inc. Office or RCA Authorized Aviation Dealer.

**AVR-20 Aircraft Receiver.** New, light-weight receiver for the 2300-6700 KC range. Weighs only 6 pounds, 3 ounces. Designed for use with AVT-15 and AVR-15. Crystal control on two preselected frequencies. Available for 6 or 12 volt operation. Complete with tubes. CAATC #235 . $125.00

**AVR-15 Aircraft Receiver.** Weighs only 4 pounds, 12 ounces. Radio beacon and weather broadcast receiver. Available for 6 and 12 volt operation. Complete with tubes, headphones and cable to operate with AVT-15 aircraft transmitter. CAATC #227 and #228 . . . . . $99.50

**AVT-15 Aircraft Transmitter.** Small size—big performance. Weighs only 18½ pounds. Conservatively rated at 7½ watts output. Used with AVR-15 receiver for a reliable two-way aircraft system. Available for 6 or 12 volt operation. Complete with microphone, tubes, and crystal. CAATC #215 and #216 . . . . . $292.00

**AVA-51B and 51C Power Unit.** A new, high efficiency vibrator power unit for aircraft receivers. Designed to supply either one or two AVR-15 or AVR-20 Aircraft Receivers. Light weight and small size. Available for 6 and 12 volt operation. Also ideal for replacing high voltage dry batteries in your present receiver, permitting complete operation from the aircraft storage battery. CAATC #441 and #442 . $46.50

RCA *for Aviation Radio*

RCA Manufacturing Co., Inc., Camden, New Jersey

*A Service of the Radio Corporation of America*

(*Continued from page 94*)

Emery, flies in Taylorcrafts. Last year 43 students soloed and their charter business was excellent. A new Taylorcraft and a Luscombe are on order and the partners expect a big summer.

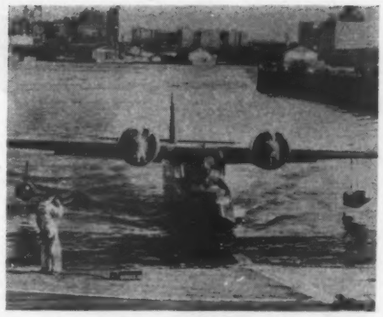
A fourth operator, Harold Lenz, with a base at Sky Harbor, lost his barge and two seaplanes in a fire recently, but he is getting new airplanes and expects to be back in the running this summer, probably from a base at Seacaucus. The success of these four bases is typical of what can be developed when operators capitalize on the natural desire of people to be near the water.

Another rapidly growing seaplane base near New York is on the Hudson River at Dobbs Ferry. The Westchester Private Flyers used to fly land planes from the Valhalla airport. Last spring the club moved to Dobbs Ferry, constructed a float, a ramp with a marine railway and a small hangar. Starting in carefully, they bought one Cub on Edo floats, but members were so pleased with off-the-water flying that a second Cub, with a 65-hp. engine, is now being delivered. The club has over 60 members, headed by George Helwig who is president, and Ross Weaver, treasurer. Lee Lord is instructor.

Nelson Miles, who operates out of the Gulf Seaplane Base at Fort Washington, Long Island, has run a successful seaplane business for a number of years. He does a lot of charter work, operating Bellancas, Stinsons and other such planes. The Gulf hangar services some 40 seaplanes. The McKinley Pneumatic Float Corp. has a base at Babylon, Long Island, and teaches a CAA college group seaplane flying, and hangars a number of private planes.

The story of the Wall Street ramp in New York is fairly well known. Every year sees more business men commuting by seaplane. This successful development is typical of what every large city on a water front will have in a few years.

In the Los Angeles area, the chief exponent of seaplane flying is Kenneth Baetz, who is now in his third summer at Cabrillo Beach. He has done two things particularly well: provided practical and attractive facilities, and he has done a good job of advertising. Facilities consist of a float, ramp, dolly and a hangar, plus a ticket booth, wind sock, and a nice set of signs that advertise his business. Baetz built an efficient dolly, and also constructed his float, the latter at a cost of less than $100.



**A Grumman amphibian arriving at New York City's Wall St. seaplane ramp.**

**A Beechcraft biplane on floats with an Edo towing dolly.**

**A Waco about to take off.**

Baetz's dolly is home-made, but it is very efficient. A pair of auto wheels is mounted on an underslung axle, with a long tongue extending forward for handling purposes. Main wheels are just back of mounted plane's CG and a pair of auxiliary wheels is set in front.

Business is about equally divided between pilots taking instruction or renting the plane for local flights, and the general public buying $1 joy hops or longer scenic rides over the Los Angeles harbor. Baetz is the only commercial seaplane operator in this vicinity. He uses a Cub 40 on Edo floats. Wes Carroll and Clyde Schlieper, also flying a Cub, have done some seaplane work out of Newport Harbor.

### Advantages in Teaching

Seaplane fans claim that one of the greatest advantages comes in teaching. A student learning to fly tries to get in as many take-offs and landings as possible. But at a busy airport a student has to circle the field after every take-off, and he may have to go around twice. In seaplane instruction a student can take off and land in a straight line. Al. Hummers, who flies at Ridgefield Park, reports he got in twenty take-offs and twenty landings in a half-hour period of instruction. There is also a reduced mental hazard for the beginner because there are no trees, telephone posts or other obstructions in the way.

Safety is also a factor. A seaplane that stalls or spins in usually lands in such a way that a wing-tip and a float hit the water first. This provides a cushioning effect. Planes have been completely demolished on falling into the water but pilots are seldom seriously injured.

### What does it cost?

The problem of first cost stops some operators from buying seaplanes. Floats for a light ship cost $600. Corrosion proofing costs $100 and the factories charge about $60 to install the floats. This adds a list increase of $760 to the cost of a land plane. Many operators figure they save a good share of this in reduced hangar and airport expenses. Seaplanes can be simonized and left out on the water all summer. Around salt water extra care is necessary to stop corrosion. But the additional cost of a seaplane over a landplane can usually be made up by the increased business during the summer months. If the operator also flies from an airport, he can remove the floats in the fall, put on wheels and still get his winter business. Through the South, floats are good the year around.

### Ask Captain Fogg

Operators who want to get full information about any phase of seaplane operation should get in touch with Captain Robert Fogg, Airport Development Section, CAA in Washington. He knows the situation from coast to coast. He will provide literature describing seaplane operation, and has many plans and specifications for bases, ramps, marine railways and dollys. He has been flying seaplanes for over twenty years and is a real enthusiast. In addition to the technical details, he is a master showman at knowing how to draw in the crowds for seaplane openings and ceremonies.

"Take to the water" is good advice for many operators because the public is fast becoming convinced that they can get plenty of fun on floats.

## Vultee Production

(*Continued from page 41*)

and built in our shops. This machine is powered with a high frequency electric motor which drives it at speeds up to 10,000 rpm, as compared with a maximum of 2500 rpm on conventional metalworking mills. A considerable number of operations are performed on this mill, two more of which are being installed to give us a battery of three of these high speed machines. An example of the time reduction through use of this fast cutting tool is given by the time of one hour and fifty five minutes recently established for a milling job which had previously required about thirty hours.

In addition to such machines as we have developed ourselves, we have been able to purchase and install many different types of equipment representing the last word in aircraft production technique. One such machine is the Erco automatic riveter which we use in the bench assembly department. With this machine one man can do the work of several by former methods. The Erco punches the hole, inserts and heads the rivet, all in the twinkling of an eye. Vultee is the first plant to place this new machine in operation although other factories now have them on order. In our steel tube structure assembly department we have adopted electric arc welding almost entirely. Through use of special jigs and arc welding we can assemble steel tube frames without any appreciable distortion. Perhaps the most elaborate and efficient steel tube welding jig yet developed is now at work in our fuselage department. This jig is mounted on a large cantilever frame which carries a master jig set-up in the center, and two side plate jigs on rollers. These side jigs start at the end of the large master jig, where they permit workers and welders full accessibility for simultaneous assembly of the two fuselage side frames. As these frames are completed the frame jigs are rolled into position on the master mount in the center, and cross members are tack welded in place. The side frame jigs are then rolled back to their original positions and new frames started while final welding work is done on the main fuselage unit, now held in position by end jigs at the center of the master jig frame.

**Rotating jigs eliminate awkward working positions and lost time in shifting work to a more accessible position. A quick flip of jig makes work available.**

Throughout the various departments where jigs are used for assembly it is standard practise to make them rotating so that the work may be made fully accessible to the worker. Certain precision jigs, such as for the monocoque after-portion of the fuselage, are built on rigid cantilever bases which prevent distortion yet permit ready access to the work from every direction.

Location of the paint shop in the center of the factory instead of at one side or entirely outside the main building, as has been common practice, has already proved itself a major point in smoothing out the flow of material along the various sub-assembly lines feeding into the final assembly line. Of course the paint shop is fully fireproof and is protected by water curtains, automatic sprinklers, and fire doors.

The aircraft production problems of tomorrow are to a great extent unpredictable. With aircraft manufacturing technique developing as it is, our ideal factory of today can become outmoded by tomorrow unless we keep everlastingly at the job of keeping it up to date through study and improvement—and that is exactly what we intend to do.

**Engineers spent much time and thought over designs of Vultee final assembly jigs. They are of rigid cantilever construction and provide for great accuracy.**

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In like manner Westinghouse has developed scores of improvements for the industry, such as precision motors and controls for parts manufacturers, complete airport lighting, radio range equipment and instruments. Thus by continually adding new products for use on the ground or in the air, Westinghouse has always kept pace, and often led, in contributing to the progress of aviation.

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**2 FREEDOM FROM TENDENCY TO SPIN** They practically have to be forced into a spin, and recover with a minimum loss of altitude when the controls are released. The biplanes can be turned completely around in a normal way in 15 to 20 seconds when fully stalled.

**3 HIGH PERFORMANCE** Beechcrafts have *proved* their superior speed in *every* major free-for-all cross-country race since 1936. Their unique performance at high altitude has made them the choice of those whose business is carried on at high altitude; the mapping photographers.

**4 LOW LANDING SPEEDS** They have the lowest landing speeds of any airplanes in their weight classes. This is achieved by use of very low wing loadings and not by means of oversize flaps, which would tend to require precision landing technique. Beechcrafts are easy to land in small areas by day or by night.

**5 WEIGHT CARRYING EFFICIENCY** Beechcrafts are economical of fuel because of their high speed at low percentage of rated power. As a result they carry more load over long non-stop distances.

**6 SUPERIOR FLIGHT VISIBILITY** Increased student activity has put a premium on flight visibility around busy airports. The unique Beechcraft curved safety-glass windshield permits the pilot a clear view toward the inside of any turn; *over the upper wing.*

**7 COMFORT** Beechcraft occupants enjoy ample ventilation at controlled temperature, soundproofing, foam rubber seat cushions, and well-appointed cabin interiors. Retractable landing gear and flap mechanisms are electrically operated and require no exertion.

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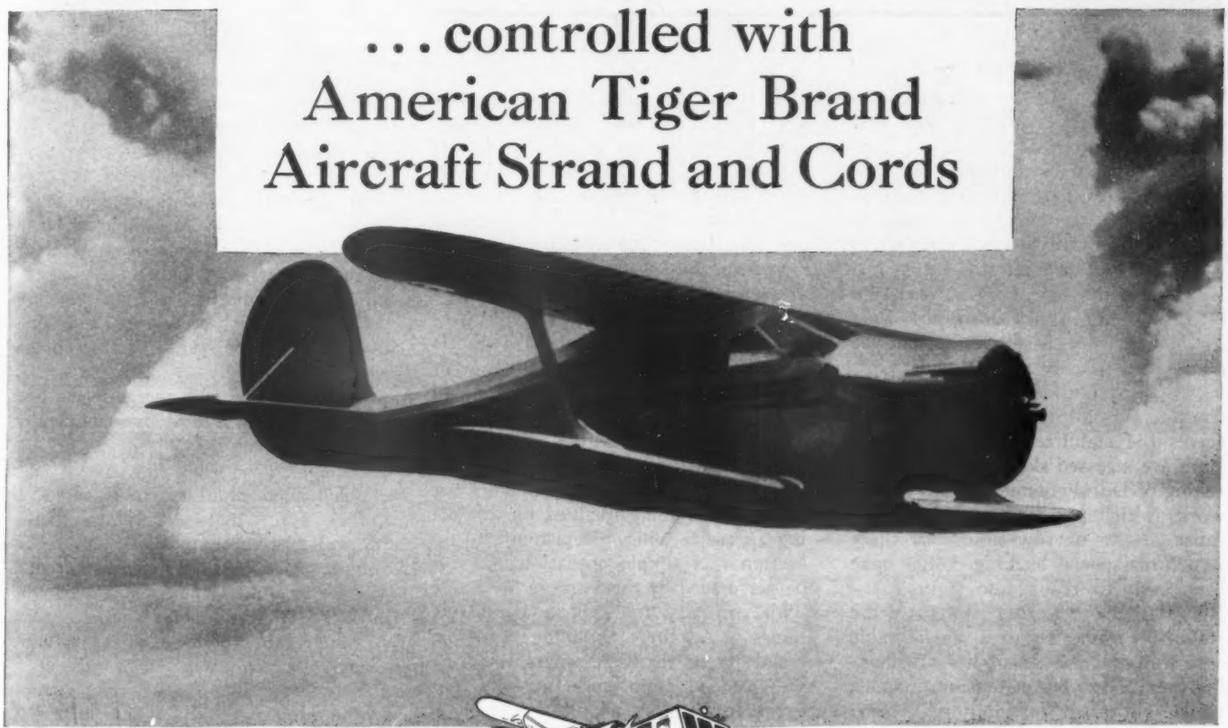
# BEECHCRAFT

# *Snow Cruiser's Pickaback Plane*

## . . . controlled with American Tiger Brand Aircraft Strand and Cords



(Above) *Beechcraft, similar to the D17A Model, which is specially equipped and mounted on skis for use by the Byrd Antarctic Expedition. All controls are rigged entirely with American Tiger Brand Aircraft Strand and Cords.*

MOORED on the roof of Admiral Byrd's famous Snow Cruiser, now in exploratory duty in Little America, is an interesting five-passenger Beechcraft biplane, mounted on skis. This ship, equipped as a laboratory, carries special aerial cameras for use in photographing and mapping the polar continent, Antarctica, from the air.

It is only natural that an airplane designed for service over the frozen wastes surrounding the South Pole, thousands of miles from the nearest airport, should be constructed of the most dependable products available. That's why all controls are rigged entirely with American Tiger Brand Aircraft Strand and Cords.

These cables are a standard specification of successful aircraft designers and builders, for use in the control systems of commercial, private, and service craft. Composed of uniformly cold-worked wire, precision-drawn to high tensile strength, these cables offer superior strength, excellent fatigue resistance, and minimum stretch. They meet all requirements of the latest U. S. Army and Navy specifications.

**THREE CONSTRUCTIONS:**

American Tiger Brand Aircraft Strand and Cords are available in either tinned, galvanized, or U·S·S Stainless Steel, in the following constructions:

| | |
|---|---|
| 19-wire Strand . . . . . | semi-rigid |
| 7 x 7 Cord . . . . . | flexible |
| 7 x 19 Cord . . . . . | extra-flexible |

**AMERICAN STEEL & WIRE COMPANY**

*Cleveland, Chicago* USS *and New York*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Export Company, New York

**UNITED STATES STEEL**

# How Luscombe Builds Metal Planes

(*Continued from page 45*)

treated member, and the gears have been sent out for this processing. Luscombe has since installed its own heat treating equipment.

Because of its semi-cantilever construction, the Luscombe gear requires only a .125 stainless steel strap to complete the triangle from the axle to the extreme inside of the upper leg. Because of the absence of an external oleo strut and shock cord, the Luscombe gear gives a slender appearance and is more easily streamlined.

After installation of landing gear, wheels and tailskid, the fuselage receives the stabilizer and vertical fin. Both are stressed skin structures, consisting of Dural channel section frameworks which are jig assembled. Because of the narrow nature of these structures special bucking dollies have been built to reach into tight spots. Riveting the covering skins to the stabilizer frame requires considerable care to avoid the possibility of allowing them to get out of tension in spots, which will cause "oil canning."

Elevators, ailerons and rudder use corrugated Alcald covering skins. These skins are cut to shape on the Niagara shear and on a bench shear, and fed into a corrugating die on the Lynch press brake which automatically maintains the same distance between corrugations. This corrugating process was formerly done entirely by hand. Ailerons are mounted to the wing on ball bearings.

The visitor to the Luscombe plant frequently wants to know what all the "rails" are for. The I-beam extrusions, which are wing spars in the rough, are neatly stacked in one section of the sub-assembly division, and at first look something like shiny railroad rails. Templates with hardened drill dies are clamped to the spars which are quickly drilled for fittings, reinforcement plates, etc. All fittings are riveted to spars by jaw riveting machines in a few minutes. The spars are then placed on the wing racks, ribs are placed into position and riveted on with Chicago squeeze riveters. Ribs are made up well in advance. The curved top cap strips are still formed by hand in a mold. The vertical rib stiffeners are wide channel sections of light Alclad. Nose ribs are simple stampings, several of which have fairleads riveted into them for aileron cable guides. Leading edge is .020 Dural riveted to ribs and spars.

Though the Luscombe wing is a very simple and light structure it has withstood a load of 8G. This is significant when it is considered that most military airplanes are built to take loads of 9G. Aside from being the only light plane with a metal wing structure, the Luscombe also possesses another unique advantage. In most cases of wing damage the tip is usually the most damaged part. With this in mind, Luscombe engineers conceived the idea of splicing to the end of each spar a lighter 3½ foot channel section which would give way quickly in a crash involving wing damage. This idea has saved many owners the expense and time involved in rebuilding an entire wing. Replacing the tip section is a simple operation and can be performed by the average mechanic with ordinary tools in a couple of hours. Another advantage of the metal wing is that spars can be straightened with ease in event of severe damage.

When the wing structure has been completed it is routed into the paint shop where it is treated to a bath of P27 primer before covering. Ready-made wing covers are then sewn on and doping proceeds in the conventional manner. Six coats are used, and all wings are finished with aluminum dope unless a special paint job is ordered. Wings are then routed to special racks in the final assembly division awaiting the airplanes to which they have been assigned.

Meanwhile fuselages are coming through the assembly line in rapid succession, and after tail surfaces are installed, motors are placed in their welded steel tubing mounts.

Luscombe models now in production use Continental 50, 65 and 75 hp. engines, as well as the Lycoming 65 hp. engine. An oval-shaped gas tank with a capacity of 14 gallons is then hung in the rear of the cabin by cables carried through the top rear fuselage skin.

The nose cowling is an Alclad stamping made by Teicher Manufacturing Corporation and finished and fitted within the Luscombe plant. Entire cowling from firewall forward is one unit after riveting together in a special jig. Final fitting is by hand.

Simultaneously with the cowling fitting the control system is installed just after the fuselage is lined with soundproofing material when called for. The control system is a steel tubing structure made within the Luscombe plant. All cables are cut and spliced up in standard lengths well in advance.

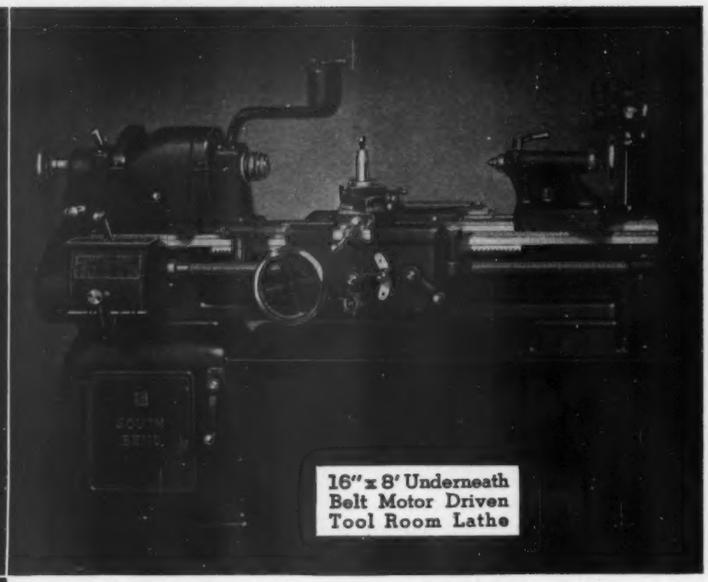
Finished fuselages are rolled into the final assembly division where streamlined V wing struts, jig welded within the plant, are fitted and wings installed. Pyralin windshields are riveted together, doors and upholstery are installed and instruments placed into position and connected to their respective engine connections. Landing gear fairing is put on and all special paint jobs, striping, etc., are also done in this stage. The airplane is then completely inspected again, a propeller fitted, and the ship is test flown, licensed and delivered to the customer.

Recent new machinery which has enabled such rapid assembly includes a DeWalt circular saw for steel tubing, all sorts of extrusions, square or round. Two scroll shears enable workmen to cut curved surfaces accurately. A Bliss press with a capacity of 35 tons punches out instrument panels, seat bottoms, etc. Sanders, grinders, portable arc welders, Kempsmith milling machine table, lathes, a Doall metal band saw, numerous Chicago air drills and riveters all help cut down labor time and improve the efficiency of the rapid assembly. By making its own dies Luscombe has further reduced the cost of outside labor.

At such a time when production reaches a much greater rate, there is the possibility of further keeping costs low by installing gang punch presses, riveters and drill presses. The present rate of production is leading towards the installation of such specially manufactured shop equipment, which will maintain low cost in large quantity production.

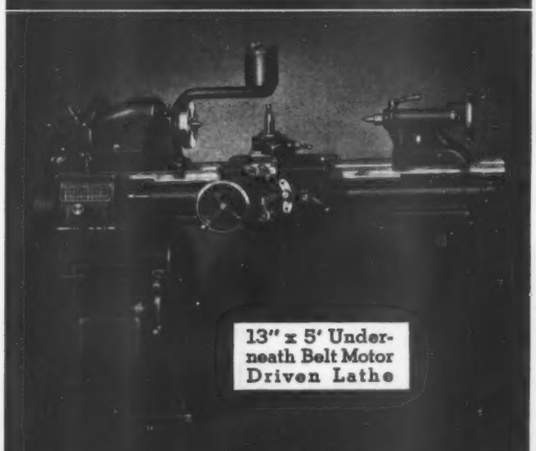
In order to insure accurate workmanship in every stage of production, and eventual satisfaction to every customer, Luscombe has inaugurated a highly specialized method of inspection. Every rivet is carefully inspected by men who have had considerable experience in this type of construction. Contrary to the common conception, there is no student labor in the Luscombe plant. Luscombe school graduates make up most of the employees as they are especially trained in metal construction for at least one year. A visual control system has been inaugurated for an accurate check on the progress of each plane through the plant.

1" Collet, 10" Swing Precision Lathe



16" x 8' Underneath Belt Motor Driven Tool Room Lathe

14½" x 6' Countershaft Driven Tool Room Lathe



13" x 5' Underneath Belt Motor Driven Lathe

9" x 3' Workshop Precision Bench Lathe

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## Lenape "Brave"

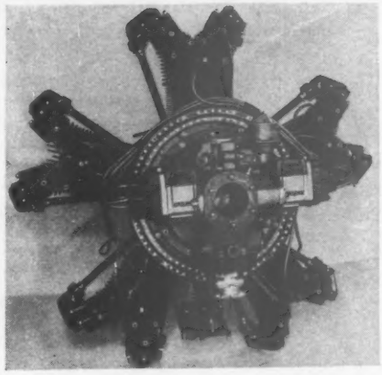
(*Continued from page 61*)

threads, which anchor into the aluminum "Y" alloy cylinder head. The top portion, which protrudes from the cylinder head proper, is ¼ in. in diameter with standard S.A.E. threads.

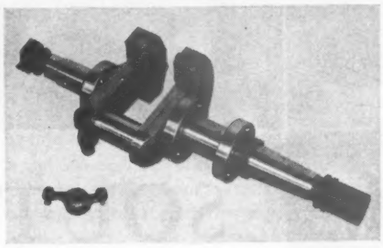
Many features of the valve assembly are worthy of notice, such as a double row of S.K.F. ball bearings in the rocker arms, Thompson silcrome valves for both intakes and exhaust, provision for full force feed lubrication of rocker arms and double valve springs, one within the other which makes it possible for the engine to operate in the event of a broken valve spring. A small steel circlet is added for safety to all valve stems. Bronze valve seat inserts of unique design prolong the life of the engine by permitting renewal in the event of wear and valve guides are fabricated from a special bronze alloy. In the event of lubrication failure these guides will give unusual emergency service without undue damage to the valves themselves.

A great factor in the saving of weight on this engine is the use of a magnesium alloy crankcase, which is lighter than aluminum and weighs less than 22 lb., with all studs screwed in place. The case itself is split on the center line of the cylinders and through-bolts used to fasten both halves together. Provision is made in the crankcase design for the oil to preheat the incoming gases from the carburetor, and a special manifold which acts as an external oil sump is connected between the carburetor and crankcase. All the cam mechanisms and cam followers are inclosed in the front half of the crankcase and are insured of adequate lubrication through oil passages. From the maintenance standpoint, this is an interesting feature because all wearing parts are replaceable.

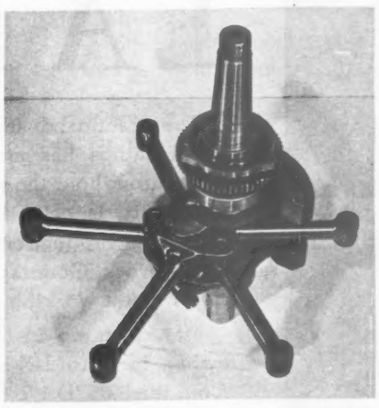
The crankshaft is designed with four main bearings from S.A.E. No. 3140 steel forgings. There are two sets of ball bearings on the front half of the crankshaft, one of which is a deep-grooved double thrust bearing which takes the thrust from either direction and thus makes it possible to use the motor as a pusher as well as a tractor without any change. The rear half has a ball bearing adjacent to the crank throw, and a plain bearing on the extreme rear which acts as a constant oil feeder as well as a steady bearing for the overhanging shaft which drives the accessories.



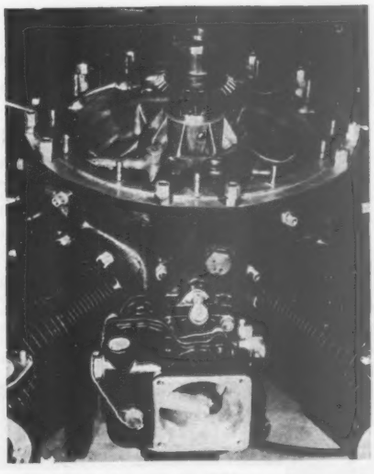
Rear view of Lenape "Brave".



Crankshaft and rocker arm



Crankshaft, rod and counterweight assembly.



Rear half of crankcase accessory case removed.

Phosphor bronze counterweights are so designed that a boss of one goes completely through a hole in the crankshaft cheek and through a hole in the opposite counterweight. This boss absorbs all the loads resulting from centrifugal forces and the bolts used to tie the weights to the crankshaft are not forced to carry this centrifugal stress.

The master rod and the link rods are of tubular construction, machined from solid forgings of S.A.E. # 3140 steel. The master rod has a lead-bronze, diamond-bored crankshaft bearing, which is very large, and is free to rotate, thus giving a double bearing surface, one on the interior of the master rod, the other on the exterior of the crankshaft throw.

The magnesium alloy accessory drive case bolts to the rear half of the crankcase. A simple bevel gear on the end of the crankshaft drives four other bevel gears. Two of these drive the horizontally mounted magnetos, independently, thus providing true dual ignition. A third bevel gear at the bottom of the case drives the oil pump and the fuel pump of the Romec or Pesco vane type. The fourth bevel gear at the top of the case powers the tachometer and the generator drive and also a fitting for an a.c. fuel pump if such should be desired. The unique lower fuel pump drive from the oil pump shaft incorporates a design which insures positive lubrication for the fuel pump packing gland at all times. The alternate fuel pump drive at the top of the engine is designed with a cam which is part of the vertical shaft of the generator and tachometer drive, which makes provision for the less expensive diaphragm pump of automotive type.

A vibration absorbing mounting ring, constructed of steel and rubber, serves to reduce shock and prevents undue wracking of the airplane structure. Another instance of weight-saving is the magnesium alloy propeller hub. The steel hub, originally used by Lenape, was approximately 50 per cent heavier than the magnesium hub.

**Lenape Engine Specifications**

| | |
|---|---|
| Rated horsepower | 95 |
| Weight (Dry) | 192 lb. |
| Bore | 4½ in. |
| Stroke | 4 in. |
| Piston displacement | 275 cu. in. |
| Compression ratio | 5.1:1 |
| Rated engine speed (r.p.m.) | 2200 |
| Overall diameter | 36 in. |
| Overall length | 24 in. |
| Fuel consumption gal. per hr.-cruising | 6.48 |

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WESTON *Dual* Carburetor Air Temperature Indicator (resistance type)

WESTON *Dual* Oil Temperature Indicator (resistance type)

## Don't Give Up the Ship

(*Continued from page 37*)

should come from cross-country flying. A pilot who has served his apprenticeship flying close to the airport under the CPT plan has had sufficient basic instruction to fly cross country. Two pilots who fly together not only add to the pleasure of the trip but can split the cost.

There are undoubtedly all sorts of interesting places in your vicinity to which you can fly. Fishing and hunting spots, air meets, vacation resorts, class mates' homes . . . the list could be extended indefinitely. Private pilots have always enjoyed flying cross country in loose formation. Perhaps you could get two or three ships to make a tour together.

A number of operators have agreed to rent ships, such as Cub Coupes and Luscombes, with two-way radio for $8 per hour, with a minimum guarantee. You could rent a ship Saturday morning, fly to some cross-country point, and return on Sunday. Yet you would pay only for the time you were in the air plus a small additional service charge.

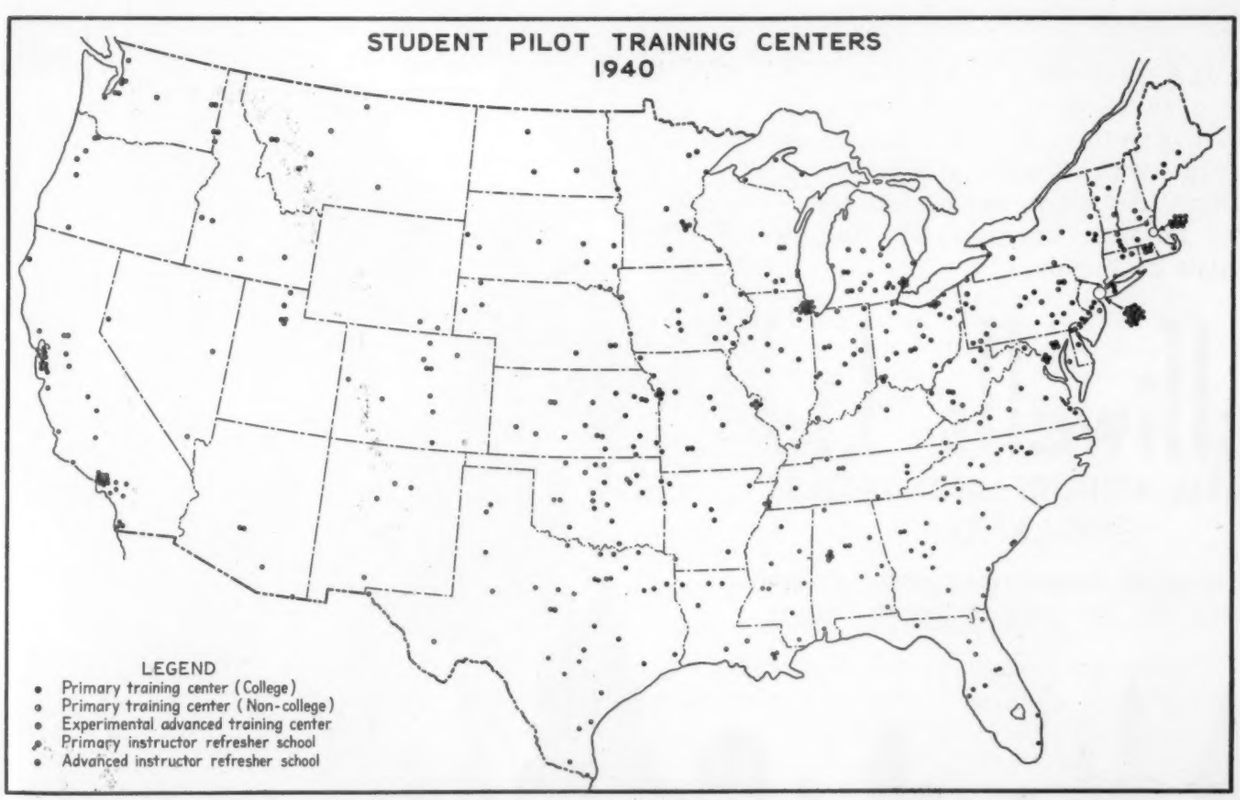
Perhaps you live near a seaplane base, or will be spending part of the summer near a lake or river, or along the shore, where you can get the new thrill of seaplane flying. The seaplane pictures in this issue should appeal to everyone who enjoys being around the water. After you have had a few instruction trips and have been checked out on floats, you will be delighted with flying over the water and with the freedom you can get from being able to put your ship down anywhere on the "water airports". You really have something to look forward to if you have never done any seaplane flying.

Piloting, like many other skills, needs to be kept up if efficiency is to be maintained. In aviation circles there is considerable talk of corrosion. It attacks pilots as well as airplanes. With pilots, it gets in its work most easily during vacations from flying when the pilot's techniques and skills become rusty from lack of use. To keep in good flying form, try to get out to the airport every week.

Many students who have had the first 35 hours or more under the Civilian Pilot Training program will return to college in the fall and will want to apply for advanced, second-year instruction. Although CAA has not announced details of the advanced instruction, some off-the-record advice can be given about how to qualify. There are sure to be many more students applying for second-year instruction than can be accepted. It seems logical that CAA will want to accept students who have two qualifications: an excellent record during primary training, and an intention to keep on flying. If you want further CAA training, you can definitely help yourself to qualify by building up some additional flying time this summer. But keep your record clean!

Another advantage to flying this summer, in addition to all those we have mentioned, is that it will help you to get an aviation job after leaving college, if that is what you want. Many of you are attracted to aviation and are wondering how you can make it pay as a vocation. There are many jobs in which the chief requisite is being a skilled pilot. Every private-airplane company in America is looking for top-notch salesmen. There are lots of salesmen, and lots of pilots, but a combination of the two is not easy to find. Many college students have been studying economics, merchandising, advertising and selling in preparation for a business career. If

(*Turn to page 110*)




**Find an airport near your home. There are also many other places to rent ships in addition to these 500 CPT operators.**

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**AIRCRAFT** The Modern Aircraft section presents photographs (379) and descriptions (specifications, construction details, listing of standard equipment and instruments, performance figures, engines, etc.) of all the aircraft currently produced in every country of the world. Set out in attractive array are the Heinkels, the Messerschmitts, the Spitfires, the Wellesleys, the Airacobras, the Curtiss Hawks, and all the planes currently mentioned in the world's newspaper headlines. Some periodicals occasionally run photographs or descriptions of the planes made in their own country, but AEROSPHERE spreads before you all the planes of the entire world! Following the Modern Aircraft section are some 63 pages of specially compiled vital aeronautical statistics.

**DIRECTORY** One of the very important contents is a 274-page International Trade Directory all set up for the easiest possible reference. First listed in alphabetical order are all firms and organizations in any way affiliated with aviation, their address, personnel, branch offices, export representatives, products made, etc. This is followed by the Product section, where listed under the name of each product used in the construction or operation of aircraft are the names of the firms making that product. All the principal countries (34) in the world are covered.

Among comments voiced by those who have already seen AEROSPHERE were these: "AEROSPHERE makes history"—"superb"—"colossal amount of data"—"a super-Jane's"—"most unusual publication"—"worth waiting for"—"outstanding contribution to the aviation industry," etc.

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(*Continued from page 107*)

they have the nack of selling, and learn to be safe, steady pilots, they can look forward to a profitable future selling airplanes. Airplane selling today is about where automobile selling was in 1915, and the tide is surging upward and is sure to bring profits to smart salesmen.

There are also many other aviation jobs where piloting is necessary. The oil companies, aviation schools, fixed-base operators, and many companies using airplanes in their business will need an increasing number of skilled pilots each year. Airlines are searching for men who meet their standards. Both the Army and Navy have attractive offers for college men.

But 35 or 40 hours of flying won't get you a job. That is just a beginning. A pilot has to build up considerable more flying time before he can convince a business firm that he is a safe, dependable flyer. If you are a sophomore or junior this year and can get in a full summer of flying, and continue to fly until you graduate, you should have enough flying time to find a job when you graduate.

**Follow the Rules**

Every college pilot should read Tom Hardin's article in this issue about accident prevention. CPT instruction has been excellent and pilots who have built up 35 or 40 hours know the rules for safe flying. While you have been under the eye of your instructors, your flying has been 1,100 per cent safer than private flying in general. That is a remarkable record.

But everyone in the aviation industry wonders if you can keep it up. What is going to happen now that you are on your own? Are you going to proceed to break loose and tear things apart just to show that you have come of flying age? We hope not. You were chosen for your intelligence as well as for your potential flying skill —and the smart flyer is one who follows the rules. Your prestige as a pilot depends on your flying record this summer. And remember that if you wash out a plane through your own fault you put a millstone around your instructor's neck. Rightly or wrongly, he carries some of your burden—so remember he is keeping an eye on you even though you are many miles away. Don't let him down.

Bon voyage for a swell summer!

(EDITOR'S NOTE: If you can not find an airport near your home on the map printed on page 107, write us for the name of an operator in your neighborhood.)

## Follow the Rules

(*Continued from page 43*)

I realize that it would be physically impossible to make this widespread change immediately, but there is no reason why it should not be accomplished in the near future. We have proof that the spin and dangerous stall can be eliminated. The spin is an absolutely useless maneuver in civilian flying, and insofar as I am concerned, both the spin and the dangerous stall are unfortunate carry-overs from the limited knowledge of yesterday's aeronautical engineers. For the present, however, pilots must learn to stay within the safety limitations of currently available aircraft.

The common objective today among all interested in private flying should be the improvement of the safety record. The Air Safety Board will cooperate by doing everything in its power toward attaining this objective, and I sincerely hope that through cooperation we can achieve a better record for private flying in the immediate future.

## Basic Combat Fighter

(*Continued from page 53*)

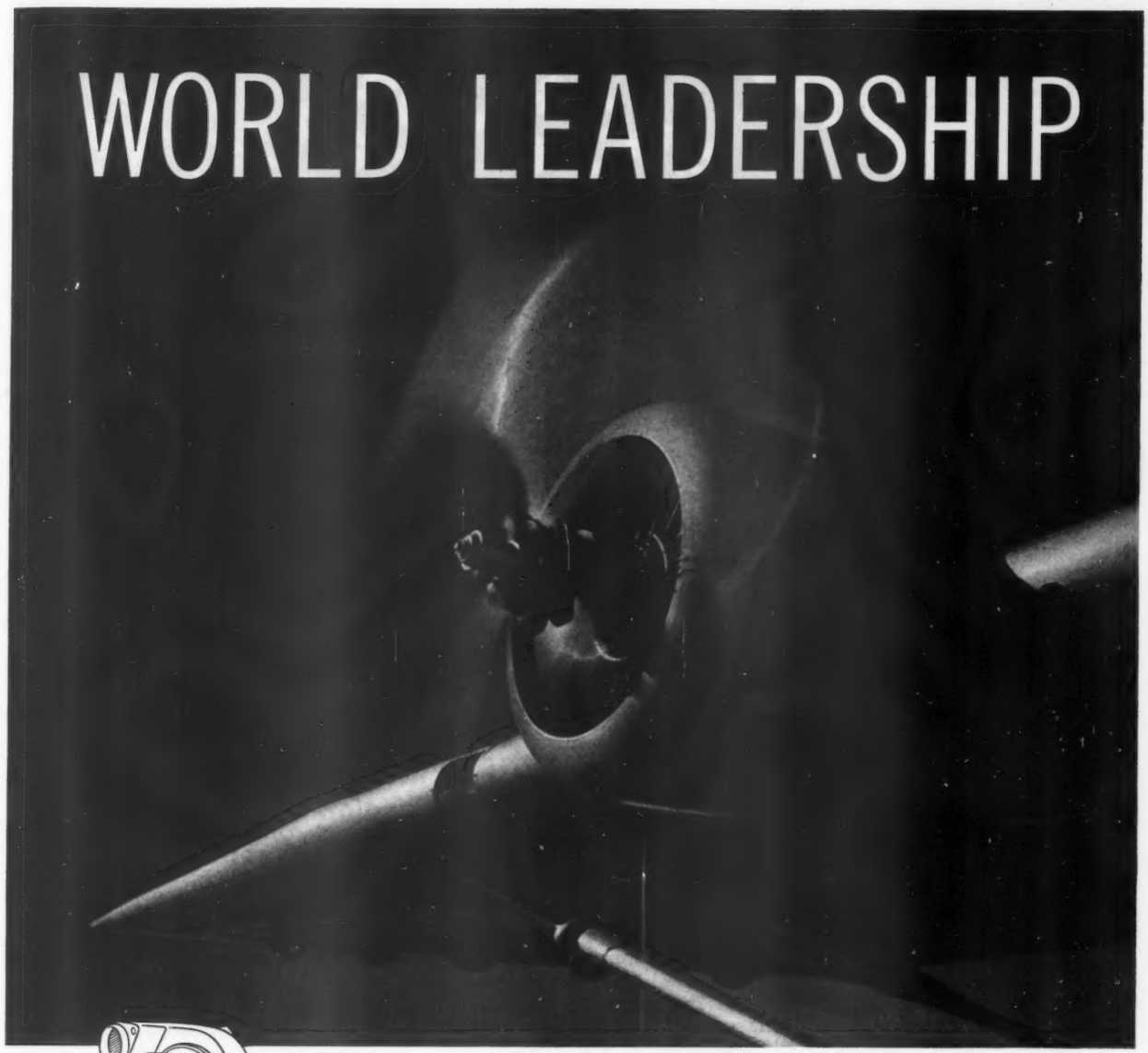
the leading edge and the hinges are four ball bearing type. The removable rudder tip contains a balance weight.

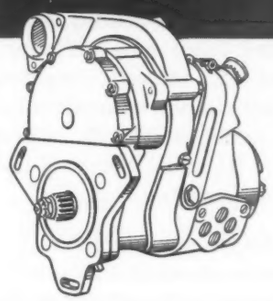
The main landing gear consists of two 27 inch smooth contour tires and 27 inch streamline wheels mounted on cantilever shock absorber struts of the oleo-pneumatic type. The struts are attached to the wing center section on fore and aft trunnion bearings, about which the gear swings inwardly for complete retraction. The wheel is connected to the shock absorber piston by means of a single legged fork of aluminum alloy box section construction.

The gear, actuated hydraulically by means of a power system or emergency hand pump, is automatically locked in the down position and locked "up" by means of an eyebolt on the axle automatically engaging a spring loaded hook. A warning horn blows when the throttle is closed unless the landing gear is extended and locked.

The tail unit of the landing gear, which is also retractable, consists of a full swiveling, steerable tail wheel employing a 10 inch smooth contour tire and pneumatic shock strut.

# WORLD LEADERSHIP





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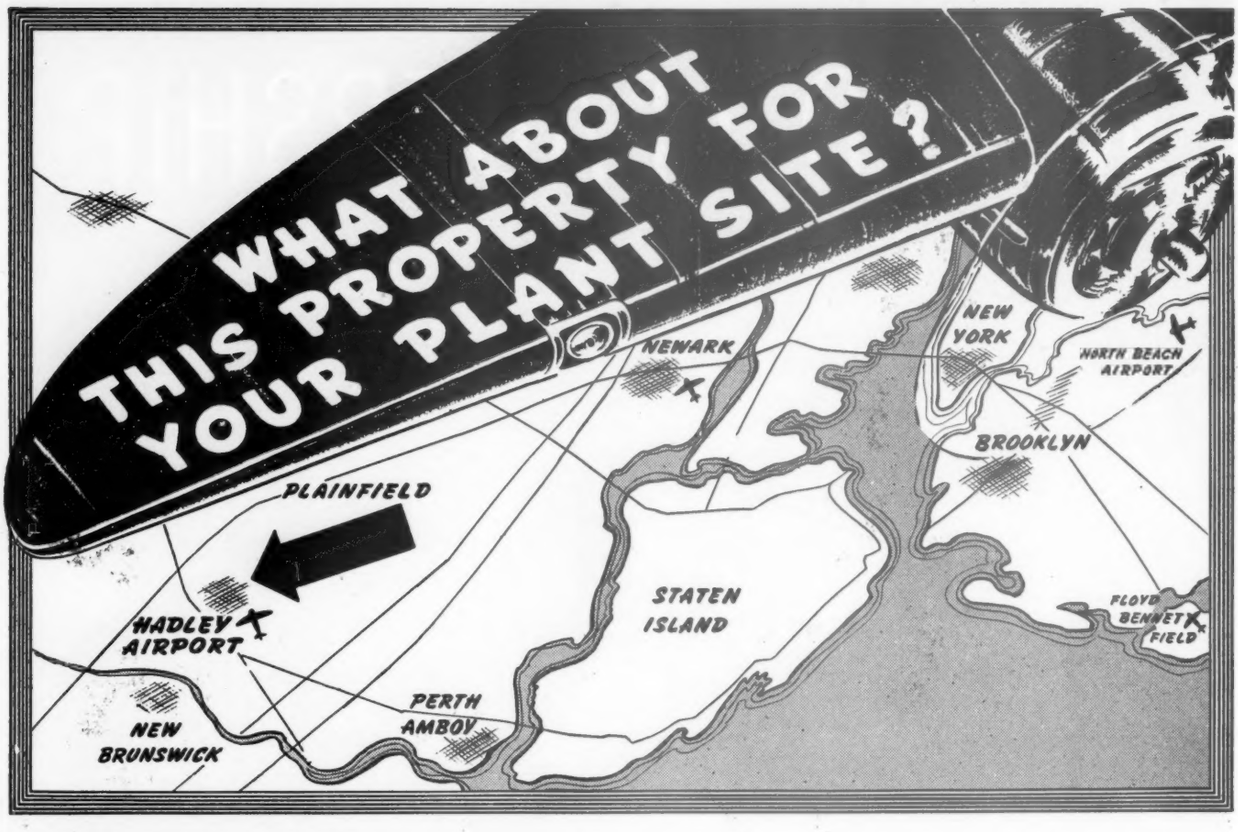


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## Recent Books

### Long distance flying technique

AN OLD CAPTIVITY, *by Nevil Shute,* William Morrow & Co., New York, N. Y., $2.50.

For those who like their tales of sub-Arctic expeditions combined with romance, Nevil Shute's "An Old Captivity" makes diverting reading. Shute, author of "Ordeal", demonstrated in that book his practical knowledge of aircraft, and in his new book deals even more painstakingly with aeronautical details. His patient recording of maintenance and of flying technique involved in long-distance flights is realistic, and should prove an eye-opener to that public which still thinks of such flights in terms of adventure, sans skill, forethought, and manual labor. His new story lacks the impact and excitement of "Ordeal", but it is a good one, with its thread of mysticism neatly balancing the fatigue and nervous tension accompanying an account of an aerial survey. Mr. Shute is an experienced writer and an experienced airman, so that his book will appeal to both the general reader and the aviation reader.

### Lessons from the last war

UP AND AT 'EM, *by Harold Hartney,* Stackpole Pub. Co., Harrisburg, Pa., $2.50.

The new book is by Harold Hartney, who commanded the First Pursuit Group in France during the first World War. This book has the distinction of being the only one about aviation in the last big war which has been written since the present war began. Col. Hartney points to many lessons learned at great sacrifice during 1914–18 and emphasizes what can be done to prevent mistakes occurring "the next time". "Up and At 'Em," is an engaging aviation story that will please many readers.

### Aviation through the years

THE STORY OF FLYING, *by Archibald Black.* Whittlesey House, McGraw-Hill Book Co., New York; 267 pp.; $2.50.

With the coming of age of the aviation industry, the public is finding its history and background an engrossing subject. Latest account is "The Story of Flying" by Archibald Black. A very good account, too, Mr. Black has set down, in a style both interesting and concise. His story concerns not only the early efforts, first flights and record flights, but the equally important record of World War aviation; the post-war boom; air mail; engines and propellers; gliders, rockets, and airships; airports, airways and radio; photography, skywriting, and mapping; accessories; modern air transport; and a forecast of future developments. All this, encompassed in 267 pages with a very complete index and well illustrated, makes a fine reference work, and should be on the book shelves of the industry at large. It is also something to think about when graduation gifts rear their heads. Archibald Black has been in aviation since 1915, as consulting engineer with the Navy, Curtiss-Wright, and as a free lance. He is the author of "Transport Aviation" and "Civil Airports and Airways".

### Aviation Directory

"AVIATION DIRECTORY AND REFERENCE GUIDE," *by Harold E. Baughman,* published by Aero Publishers, Inc., Glendale, Calif., $6.50.

With 598 pages, 7,000 listings, and 170 illustrations, the book represents a complete and accurate compilation of aviation terms and data, cross-indexed for ready reference. Contents include complete aeronautical nomenclature; and a comprehensive directory of aircraft plants, parts, equipment, accessories, repair stations, schools and personnel.

## Window Shopping

(*Continued from page 65*)

*The following catalogs or trade literature may be obtained by writing direct to the manufacturers listed:*

**Air Associates Catalog No. 18**—A complete listing of aviation materials and products in 196 pages with more than 1,300 illustrations. Air Associates, Inc., Roosevelt Field, Garden City, N. Y.

**Aero-Thread—Bulletin T-1**—A 16-pg. bulletin presenting engineering standards and technical information covering the recently developed Aero-Thread system for bolts and studs. Aircraft Screw Products Company, Inc., 25-12 41st Avenue, Long Island City, New York, N. Y.

**Chambersburg Pneumatic Forging Hammer**—Bulletin No. 1275—A 14-pg. presentation of the motor driven Chambersburg forging hammer, a tool primarily useful for forging alloy steels. Chambersburg Engineering Company, Chambersburg, Penna.

**A B C of Spray Painting Equipment**—A hand book covering the entire field of spray painting equipment. The DeVilbiss Company, Toledo, Ohio.

**DoAll Precision Saws—DoAll Precision File Bands**—Folders listing the complete line of saws and file bands for the special DoAll machine. DoAll also offers to anyone writing for it a special steel knife blank suitable for finishing into a high class hunting knife. Continental Machines, Inc., 1301 Washington Avenue South, Minneapolis, Minn.

**Ex-Cell-O Tool Tips**—Regular publication of the Ex-Cell-O Corp., 1230 Oakman Blvd., Detroit, Mich.

**Gisholt Balancing Machines**—A handsome 30-page catalog of Gisholt balancing machines. Gisholt Machine Company, Madison, Wisc.

**Johnson Bronze General Catalog—No. 400**—The most comprehensive book of this type ever produced. Over 800 sizes of plain bearings and 350 sizes of bronze bars listed. Johnson Bronze Company, New Castle, Penna.

**Kennametal Catalog No. 3**—A 32-page guide for the care and use of carbide-tipped tools. McKenna Metals Company, Latrobe, Pa.

**Kollsman Pointers**—A periodical publication devoted to information on aircraft instruments. Kollsman Instrument Co., 8008 Forty-Fifth Ave., Elmhurst, N. Y.

**New Materials Handling Catalog**—A 56-page catalog of floor trucks, jack lifts, skid platforms and other materials handling equipment. Lewis-Shepard Sales Corp., 295 Walnut St., Watertown, Mass.

**Sheet Metal Welding Fundamentals**—A 16-pg. booklet covering such subjects as design factors, control of expansion and contraction, use of jigs, welding procedure, etc. The Linde Air Products Company, 30 East 42nd St., New York, N. Y.

**Metcolizing**—An 8-pg. pamphlet discussing metal spray protection of steel, a process now finding considerable application in aviation. Metallizing Engineering Company, Inc., 21-07 41st Ave., Long Island City, N. Y.

**For Better Gears**—A 52-pg. booklet devoted to gear machining and gear forming machinery. Michigan Tool Company, 7171 E. McNichols Road, Detroit, Mich.

**The Neoprene Notebook** — Up-to-the-minute facts about a modern material. The Rubber Chemicals Division of E. I. DuPont De Nemours & Co. (Inc.), Wilmington, Delaware.

**Oxy-Acetylene Tips**—A monthly publication devoted to gas welding and cutting. The Linde Air Products Company, 30 E. 42nd St., New York, N. Y.

**Pylumin**—An 8-pg. pamphlet describing a process for protecting aluminum. Pyrene Manufacturing Company, 560 Belmont Ave., Newark, N. J.

**Simplex Airplane Jacks—Bulletin Aero 40**—Pamphlet describes a line of jacks designs especially for jacking up aircraft. Templeton, Kenly & Co., 1020 South Central Ave., Chicago, Ill.

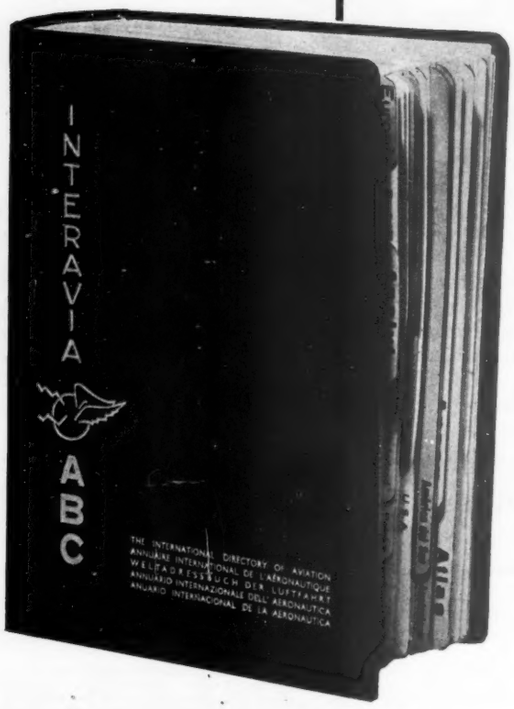
**U. S. Hose Hints**—A 34-pg. booklet dealing with selection of rubber and cloth hose for industrial use. Mechanical Goods Division, United States Rubber Co., 1790 Broadway, New York, N. Y.

**Victor Welding Equipment**—Devoted to gas welding accessories and supplies. Victor Equipment, 3821 Santa Fe Ave., Los Angeles, Calif.

**Aeronautical Fabrics**—A comprehensive paper on this subject prepared by Howard M. Brigham, Wellington Sears Company, Inc., 65 Worth St., New York, N. Y.

**Electric heating equipment**—Catalog 28-000—A 38-pg. catalog of electric immersion heaters and heating elements. Heating Division, Westinghouse Electric & Manufacturing Company, Mansfield, Ohio.

# *You'll find it here!*

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Please send me the official rules of the AOPA Golden Wings Contest immediately.

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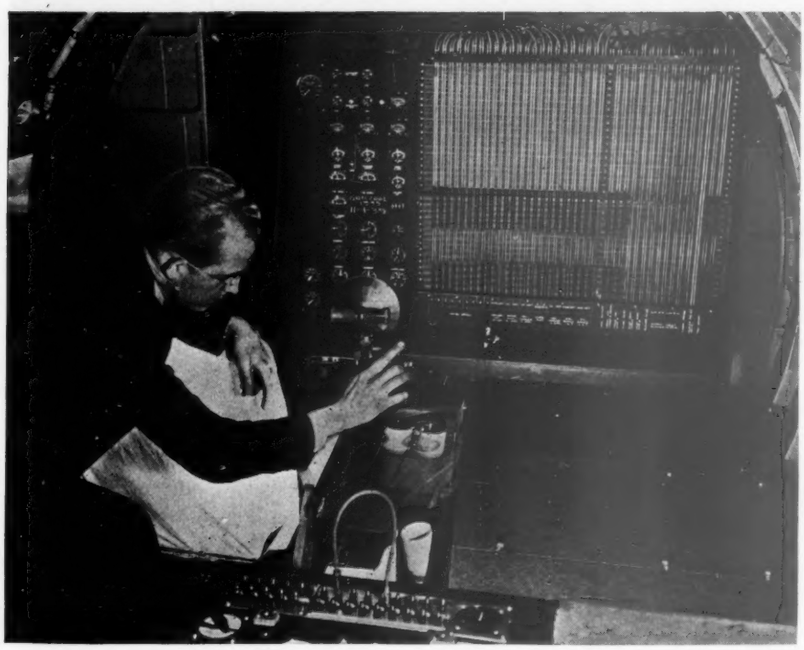

**Ingenious arrangement for recording test data. At regular intervals during test flights, this array of instrument dials and manometer tubes was photographed.**

## Into the Sub-Stratosphere

(*Continued from page 49*)

tion is NACA .0018 and tip section is NACA .0010.

Front and rear spar chords are 24ST square tubes with tapered wall section. Terminals are steel, heat treated to 150,000 lbs. per square inch. Diagonals and verticals are aluminum alloy square, rectangular and barrel section tubes. Compression ribs and intermediate ribs consist of hat channel section chords, tubular diagonals and verticals, and sheet gussets of aluminum alloy. The covering is 24ST Alclad, over 24ST Alclad corrugations. Leading edges are flush riveted.

All fuel tanks are carried in the wings, in padded cradles. Between the two nacelle locations of each wing is a 425-gallon main tank and a 212.5-gallon auxiliary tank, while a second 212.5-gallon auxiliary tank is located in each wing between the inboard nacelle and the body. The total tankage is thus 1700 gallons.

Engine nacelles are of semi-monocoque construction, providing a roomy structure for mounting of equipment and access to this equipment. The nacelles have "J" section frames and bulb angle stiffeners, with partial longerons to back up engine mount bolts. The engine mounts proper are of welded steel tubing. The landing gear, which is of the single oleo type, retracts by electrically-driven screw operation into the inboard engine nacelles.

Two different types of wing flaps are used on the Stratoliners. The Model 307's of Pan American Airways have split trailing edge type flaps while the Model 307-B's of Transcontinental & Western Air, Inc., have slotted, trailing edge flaps. In each case, the flaps extend the complete distance from body to ailerons. Leading edge slots near the wing tips have been incorporated for maximum control at the stall.

Other differences between the Model 307 and 307-B, aside from interior furnishings, are concentrated mainly in the power plants. The 307 has Wright GR-1820-G102 Cyclones (1100 horsepower each for take-off and 900 horsepower normal rating), while the 307-B has GR-1820-G105A Cyclones of the same take-off and normal rating but with two-speed supercharging for high altitude performance. Propellers are the Hamilton Standard Hydromatic full-feathering type, three-bladed, with a diameter of 11½ feet. Cooling systems vary in the two models, the PAA version having fixed ring cowls while the TWA airplanes are equipped with cowl flaps. The cantilever tail surfaces of the Stratoliner include a single vertical fin which extends forward into a low vane along the back of the body. This forward vane provides exceptional stability for high angles of yaw. The fin and stabilizers are all-metal, and the elevators and rudder are of metal structure with fabric covering. Hydraulic boost controls are used on rudder and elevators, providing ease of control under all conditions of operation. Both elevators and rudder are provided with powerful trim tabs, with which the airplane may be trimmed through a wide range of speeds, and with one or more engines inoperative. The elevators are provided with control tabs which make landings easily possible even without the use of the hydraulic boost control.

### Supercharging Equipment

The Stratoliner's cabin supercharging, heating and ventilating system is sufficiently interesting to be described in considerable detail. The plane can be operated either with or without cabin supercharging at any altitude. At comparatively low altitudes, below 8,000 feet, there is little advantage to pressure-cabin operation. Moreover, hot weather conditions frequently prevail at low altitudes so that a comparatively large flow of cool air into the cabin is desirable. For these reasons, a separate cold air system is installed in addition to the supercharging system. A blast of fresh air is rammed into a scoop at the top of the nose of the cabin, then passes through a centrifugal rain separator and then into a central duct in the cabin's ceiling where it is distributed through grills. An auxiliary ventilation outlet of large capacity in the bottom of the accessory compartment below deck permits the large quantity of cool ventilation air at low flight levels to sweep through the passenger compartment and to be subsequently discharged to the outside atmosphere. This is adjustable to suit weather conditions.

At 8,000 feet the overhead auxiliary air scoop and the auxiliary outlet are closed, and all ventilation is carried on through the supercharging system, with automatic pressure control and automatic temperature regulation. From 8,000 feet to 14,700 feet, there is no change in the atmospheric pressure within the cabin. The cabin is still at an "apparent altitude" of 8,000 feet when the 14,700 foot level is reached. In operation above 14,700 feet, a differential of 2½ pounds per

(*Turn to page 119*)

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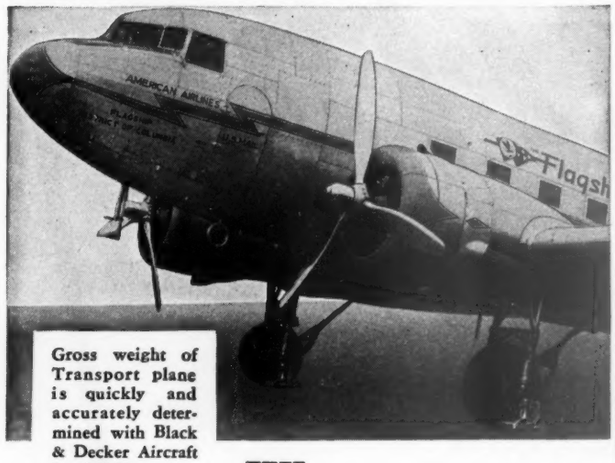

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(*Continued from page 116*)

square inch pressure between outside and inside atmosphere is maintained so that the "apparent altitude" in the cabin gradually increases. At an actual altitude of 16,000 feet, the "apparent altitude" in the cabin is approximately 9,0000 feet. At 18,000 the "apparent altitude" is about 10,600 feet; and at 20,000 feet, it is approximately 12,300 feet.

The routing of supercharged ventilating air through either one of the two duplicate supercharging systems may be described in general as follows: Fresh air is taken in through an opening in the lower leading edge of the wing between the inboard engine nacelle and the body. It then passes through a centrifugal water separator to the supercharger "blower" unit mounted behind the engine in the inboard nacelle and mechanically driven by the engine. In this "blower" the air is increased in density. It is subsequently warmed by steam radiators and then flows through a duct to the automatic flow control valve in the control unit located in the accessory compartment below deck, which maintains a constant weight flow of air through all ranges of operation. From this point it is routed to ventilation grills at the sides of the cabin at the floor level, and, if desired, to the individual adjustable ventilator outlets. The air, after circulation, escapes through mushroom-shaped outlets in the floor to the accessory compartment below deck where it passes through the automatic pressure control valve and escapes to the outside atmosphere. The pressure control outlet valve and the inflow control valve, mentioned above, are combined into a mechanical unit known as the cabin supercharging control unit. There are two of these units, each serving identical functions for the duplicate supercharging system.

If, for any reason, the air inlets in the leading edge of the wing should become plugged, a secondary inlet valve opens automatically to furnish air for the supercharger blower. This auxiliary valve is inward-opening and is located within the protected landing gear well of the inboard nacelle, in the side of the duct leading to the supercharger. The suction of the blower causes the valve to open and there is no reduction in the cabin air supply rate as a consequence.

The cabin supercharger is a centrifugal compressor having an integral speed-increasing gear box. It is mounted on the rear of the fire wall of the nacelle and is driven by a flexible shaft from the generator drive of the engine. The supercharger impeller shaft is geared at 11.625 times the engine speed. Tests have shown that with only one of the two blowers in operation, the 2½ pounds per square inch internal cabin pressure can be maintained at altitudes considerably above 20,000 feet.

A blower relief or surge valve is located in the duct leading from the blower to the cabin. This opens automatically by means of the pressure built up in the duct in case the flow of air into the cabin is throttled down by the valve in the control unit, thus bypassing the air output from the supercharger and preventing surging or overheating of the blower. During low altitude operation in warm weather, the entire air output of the superchargers may be bypassed through these relief valves to the outside atmosphere by shutting the control unit airflow valve and using ventilation from the auxiliary cold air system. Normally, however, the flow of supercharged air into the cabin is maintained even in non-supercharged operation, in which case the blowers serve merely as ventilation fans.

The air is warmed as it leaves the cabin supercharger by means of a simple steam-heating system located in the engine nacelle. Steam is generated in a boiler consisting of a finned cylinder which extracts heat from the engine exhaust. The steam from this boiler passes into banks of condenser tubes and the cabin air supply is heated as it flows past these tubes. Water for the boiler is contained in a conical-shaped sump located below it and so designed that if any of the water should freeze when the engine is stopped, it will immediately thaw upon starting the engines. A feedwater pump, driven by oil from the airplane's hydraulic system, circulates the water from the sump to the boiler. Heat output is regulated by the speed of this feedwater pump, which is automatically controlled by a thermostat located in the central part of the airplane cabin. The setting on the thermostat can be varied at will by the airplane hostess or steward.

#### Distributing the Air

After the supercharged air supply passes through the flow control valves in the accessory compartment below deck, it continues to a set of distribution valves, where it is directed into one of several alternate flow courses which may be selected according to weather conditions. During hot weather, it is preferable to divert the air into the auxiliary ventilation duct in the cabin ceiling, whence it is distributed through the overhead grills and individual ventilators for the most cooling effect. The second optional flow course consists of a series of ventilation grills in the side of the cabin near the floor, providing superior hot air ventilation during cold weather. It is also possible to direct part of the air into the overhead system and part into the floor duct system. The choice between these various alternatives is made by the hostess or steward who operates selector valve controls located in the forward end of the cabin. The major portion of the pressure air may also be diverted into nozzles extending along the lower edge of the pilots' compartment windshield for windshield defrosting.

The supercharging control unit located in the accessory compartment is a compact apparatus, representing many months of development work, which automatically regulates the atmospheric pressure level in the cabin. It contains both the air inflow valves and the spent air discharge valves. The pipe through which the spent air is discharged to the outside atmosphere passes directly through the duct for incoming warm air, which prevents frosting of the air outlet. The cabin-pressure regulation is accomplished by variations in the degree of opening in the outlet valve, which is governed by pressure-sensitive mechanisms that are responsive to absolute pressure and to differential pressure.

The cabin supercharging, heating, ventilating and pressure-regulating apparatus has been described in the singular for the sake of simplicity. All units of the system, including superchargers, steam-heating apparatus, automatic control unit, etc., are installed in duplicate in identical form and the system may be operated by either or both sets of apparatus.

#### Operation of the System

The operation of the supercharging system is vested in the Flight Engineer, although he has little to do in this connection other than to turn controls on or off, and observe the pressure instruments mounted on his instrument board in the rear right portion of the control room. He has three master levers. Two of them control the right and left supercharged air inlet valves, respectively. These two levers are normally left in one position, which provides automatic regulation of the supercharged air inflow by the automatic control unit. In the opposite position, the levers cut off the supercharged air inflow, and in intermediate position, they provide

(*Turn to page 120*)

(*Continued from page 119*)

manual regulation of the air inflow. The third master lever has three positions: One is for unsupercharged, cold air ventilation (auxiliary cold air intake valve open and auxiliary outlet valve open); the second is for unsupercharged, warm air ventilation (cold air intake valve closed and auxiliary valve open); the third position is for supercharged operation (cold air valve closed and auxiliary outlet valve closed and supercharging under automatic control.)

The Flight Engineer's instrument board has a compact group of pressure-cabin instruments, in a central location separated from surrounding instruments by a green border. Within the border are the following instruments: An indicator showing rate of pressure change within the cabin; a "cabin altimeter" showing the pressure altitude within the cabin instead of the airplane altitude; a supercharger discharge pressure gauge with a 2-way selector switch for connecting it to right or left supercharger; a suction gauge with a 3-way selector switch to show cabin pressure as referred to outside pressure or to show flow pressure in the right or left air supply ducts. At the top of the panel is an outlet valve selector switch with 3 positions. With this switch in vertical position, the cabin supercharging is controlled by both of the automatic valve control units; in the left hand position, the system operates through the left outlet control valve only, and in the right position, the right outlet unit only.

#### Ease of Maintenance

A feature of the Stratoliner is the accessibility of controls and equipment, and the ease of maintenance. All accessories such as batteries, control boxes, compressors, autosyn dynamotors, propeller de-icer fluid pumps and tanks, etc., are installed in the accessory compartment bewteen spars in the bottom of the fuselage. All of this equipment, as well as the supercharging control equipment, is readily accessible for servicing from an outside door, and the compartment is also accessible during flight. Control cables and lines under the control room floor are accessible by way of a door in the forward cargo compartment, which can also be reached during flight. A round door in the nose of the plane permits access to the back side of the main instrument panels. Accessibility to all control lines, etc., beneath the floor of the passenger cabin is provided through the lower cargo hatches. The tail cone of the airplane is readily removable for access to the tail section which can also be reached from within through the hatch in the rear pressure bulkhead.

The semi-monocoque engine nacelles make power plant equipment readily accessible. All engine mounts and power plants, complete with all equipment except for exhaust collector rings, generators and hydraulic pumps, are interchangeable within each airplane and may be installed on any nacelle of any other Stratoliner. The engine mounts are quickly detachable.

Landing gear and tail gear retracting mechanisms and wing flaps are operated in the Stratoliner by individual directly-connected electric drives, which insure positive control of the units through all positions. Individual hand cranks are also provided for emergency operation. Wheel brakes, fuel dump valves, propeller-feathering, power boost controls, and various other items are operated by the airplane's hydraulic system. There are three sources of hydraulic pressure, two engine-driven hydraulic pumps—either of which is adequate to perform the function—and an electrically-driven emergency pump mounted in the accessory compartment and controlled remotely from the cabin.

The interior of the Stratoliner was laid out to take full advantage of the size of the plane. The main passenger cabin is divided on the right side into four travel compartments separated by wood-panelled partitions, while along the left side there are nine individual reclining chairs. Each of the four compartments has deep-cushioned davenport-type seats for six passengers, which make up into upper and lower berths for four passengers, with berths running transversely in the cabin. Thus, the plane will carry 33 day passengers or 25 night passengers, including the nine reclining chairs.

#### Control Cabin

The Stratoliner control cabin was designed with special attention to convenience of arrangement and simplicity of operating procedures. Pilot's and Co-pilot's instruments are arranged in a series of compact groups to facilitate reading. Power plant controls and miscellaneous other controls are grouped in a systematic arrangement on a centrally-located stand between the two pilots. Behind the Co-pilot's station on the right side of the room is the Flight Engineer's station, with desk and instrument panel. The Flight Engineer's chair is mounted on a special, movable base which may be swung around into a position immediately behind the main control stand between the two pilots. These three flight officers, plus two cabin attendants, comprise the crew of the TWA Stratoliner. The Pan American version provides for two additional flight crew members—a radio operator, whose position is immediately behind the pilot in the left rear corner of the control cabin, and a navigation officer, for whom a special navigation compartment has been provided just aft of the main control room.

Performance figures for the Model 307 and the Model 307-B Stratoliner vary somewhat, due to the difference in power plants. Following are some approximate performance figures for the 307-B: Maximum speed at 17,300 feet is 246 miles per hour, and cruising speed at 15,500 feet is 222 miles per hour. Takeoff distance at sea level in still air with maximum gross weight (45,000 lbs.) is 930 feet. Service ceiling at maximum gross weight with 4 engines is 26,200 feet; with three engines, it is 21,300 feet; with two engines, 6800 feet. The maximum range at 50% power is 2390 miles.

## Financial Trends

(*Continued from page 51*)

company may also obtain a higher rate of mail pay, although not as favorable as originally anticipated.

Transcontinental & Western Air should, according to its estimates, fly about 147,785,000 revenue passenger miles for 1940, an increase of over 47% over 1939. This would increase passenger income to over $7,500,000 or an increase of about $2,300,000 over 1939. TWA will gain a competitive advantage over the other transcontinental lines this summer when it places its four-motored Boeing's in operation. Delivery of the first of these 5 ships is expected within the next few months.

Eastern Air Lines with a net profit of $386,486 for the first two months of this year and with record passenger traffic for March, bids fair to surpass by a wide margin its profit of $294,120 for the first quarter of 1939. Eastern, however, has no real competition and can not but help reap the bonanza of traffic it is experiencing.

Pennsylvania Central Airlines, benefitting from new DC 3 equipment installed, estimates an increase of 50% in revenue passenger miles this year. This would place its passenger rev-

(*Turn to page 124*)

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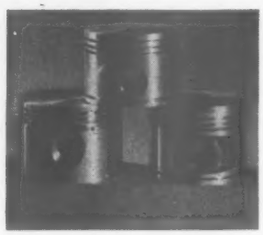

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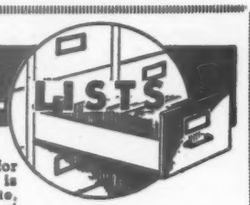

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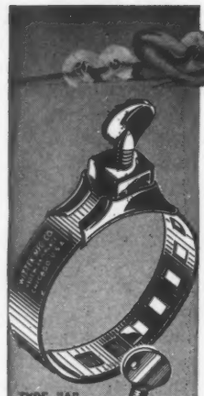


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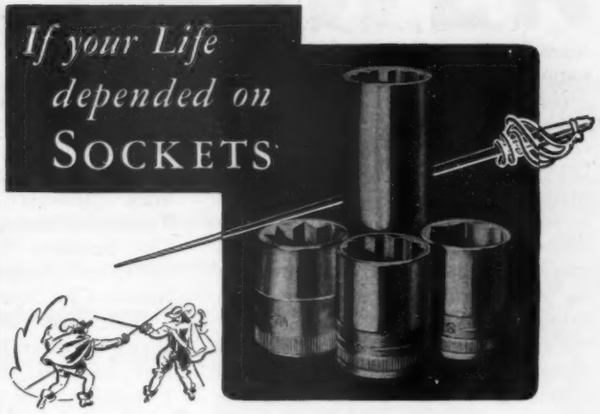

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Address .....
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(*Continued from page 120*)
enues in excess of $1,800,000 for 1940 compared with $1,270,000 last year.

Northwest Airlines, with an estimated 50% increase in revenue passenger miles this year, may bring its 1940 passenger income to $2,000,000 compared with $1,324,728 for 1939. Northwest is also hopeful that it may be successful in establishing a fourth transcontinental system by extending its present route to New York via Toronto or Windsor.

Favorable earnings by the industry may bring in its wake a number of offsetting factors. Increased operating costs along with higher rentals for use of airport facilities may be experienced. The airlines may further be faced with the burden of assuming a greater share of the costs of maintaining weather aid facilities now borne by the Federal Government.

The air transport industry has definitely come into its own, but by relative standards it is still picayune. Any number of individual companies in other industries dwarf the entire air transport industry from the standpoint of total assets, gross revenues and earnings. For example, Inland Steel Company last reported total assets in excess of $166,800,000 and for 1939 had net sales of more than $115,000,000 with net earnings of almost $11,000,000.

The present prosperity experienced by the air lines afforded an opportune time for public financing of a number of companies whose securities had heretofore been privately held. In recent months the public was permitted to share in the ownership of Northwest, Mid-Continent and Braniff. All three issues, in investment parlance, "went out of the window", and quickly sold at a premium over their offering prices. It is noteworthy that all of the Northwest offering, (100,040 shares at $14 per share) and one-third (50,000 shares at $10 per share) of the Braniff sale, represented distribution by the original ownership interests, who were thus able to realize on their pioneering in the industry.

Continental Air Lines, less bold, issued 3,636 shares at $27.50 per share to company officials and employees for a total of $99,990. As proceeds were less than $100,000 and no public sale intended, the company avoided the filing of a registration statement with the SEC.

Gradually disappearing are the companies whose ownership will continue to be privately held. With Boston-Maine Airways owned by the Boston Maine Railway and Marquette Airlines, subject to CAA approval, to be absorbed by TWA, only two of the smaller domestic companies remain under closely controlled ownership.

Several new companies, however, have been organized in the past year and have filed application for routes. Included in this group are Dixie Airlines, Missouri Central Airlines, Trans-Southern Airlines and Kansas City Southern Transport, Inc. The last named Company is a subsidiary of Kansas City Southern Railway.

With over $600,000,000 in purchases of aircraft, metals, machinery and chemicals, placed by England and France since the start of the war, that widely heralded one billion dollar order for additional aircraft was finally reported on its way after "clarification of details."

The Allies had been reported as insisting on ships of the latest and most advanced types. Inasmuch as deliveries could not be made before early 1941, previous models ordered, it was felt, would be obsolete by the time they were placed in service.

Furthermore, Congressional fear was expressed that the American national defense programs may be retarded by foreign demand.

After certain committee hearings and issuance of authoritative statements, the murky atmosphere surrounding the Administration's policy on aircraft exports was cleared. It was indicated that sales to the Allies of late models would be permitted so long as they did not incorporate secret devices. Moreover, the Army was reported as willing to release certain of its orders, now in production, to the Allies. This would expedite deliveries to the Allies and give our government the benefit of advanced aircraft developments in addition to improving and increasing our productive facilities.

Following considerable negotiations, the Anglo-French Purchasing Mission agreed "without reservation or complaint" to this government's conditions for the release of the latest types of craft. It is reliably believed that among other things, the Allies consented to defray certain engineering expenditures that may be made in the future by the companies involved in the production of more advanced types of aircraft for the United States.

The list of advanced types of aircraft released for export thus far is a very good indication where the orders will ultimately be placed. Late models produced by Martin, Douglas, Curtiss, Lockheed and Bell have been made available and presumably will be ordered in quantities by the Allies.

When awarded, this billion dollar order may not be the last from the Allies. A member of the Anglo-French purchasing Board stated that the rate of expenditure can be expected to rise with the continuation of the war, which will be "long and hard."

It is important to point out that the total of $600,000,000 war supplies purchased during the first seven months of the war does not include contracts for aircraft and other materials placed by the French and British last summer.

Enjoying the benefits of its increased productive facilities, the industry should be in a position to handle a substantial increase in orders. An output level of $50,000,000 a month is reported as having been reached by April against the $30,000,000 average which prevailed during the first two months of this year. A substantial amount of subcontracting has been done by the industry which should further increase its capacity.

The realization that big airplane orders were almost in hand, finally perked up the aircraft stocks in recent market sessions. These securities, however, continue to sell at a relative low earnings ratio. This of course, is recognition of the fact that the industry's prosperity may be short lived.

It is also becoming increasingly apparent that the domestic services are determined not to pay any substantial profits to the aircraft builders. The 12% profit limitation on all sales to the Army and Navy is one check in this direction. Almost unnoticed however, was the recent allotment of $50,000 made by the War Department to the National Academy of Sciences to conduct a thoroughgoing study of aircraft production in the United States. Among other things, this study proposes to ".....determine existing factors which affect increased output of airplanes, engines, and accessories and the unit cost of same for the air forces of the United States Government." This study may provide the Army with facts to reduce the costs of its planes.

The Glenn L. Martin Company recorded the largest profit in its history when results for 1939 showed net earnings of $4,110,605 of $3.75 per share on 1,094,532 shares outstanding. Although the company has been rapidly exhausting the $49,241,516 backlog reported as of January 1, 1940, little difficulty is anticipated in maintaining capacity operations throughout the year. With sales for the first half estimated at about $20,000,000, net profit for this period may equal earn-

(*Turn to page 126*)

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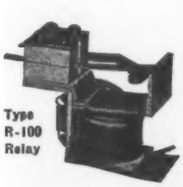

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HOT-BROACHED

**WHEN IT'S MADE BY DURO, IT'S RIGHT**

(*Continued from page 124*)

ings reported for all of 1939. Martin is believed to be one of the major beneficiaries of that $1,000,000,000 Allied order. Moreover, after completing an extensive expansion program, Martin holds out the possibility that still further expansion may be required. This time however, the inference is advanced that such added facilities will be paid for by someone else other than the company.

Boeing Airplane Company was awarded a War Department contract for $8,000,000 worth of Flying Fortresses, believed to total about 50 ships. Backlog on April 1, was estimated at about $20,000,000. The company may also augment its operations by obtaining subcontracting work from Douglas to the extent of $15,000,000 to $20,000,000 of the new Allied military purchases. Decided reorganization changes have taken place at Boeing since the return of Phil Johnson to the presidency of that company. A substantial loss, $3,284,074, was reported for 1939. The bulk of this loss was attributed to heavy development costs occasioned in the manufacture of 4 engine clippers and "stratoliners." With its balance sheet cleared of huge deferred charges, Boeing is now in a position to record its first profit since 1937.

Carrying 25% of its sales through to net, North American Aviation showed the best profit margin among the major builders during 1939. The Company earned $7,088,092 or $2.06 a share in 1939, compared to only $1,904,086 or $0.55 a share for 1938. With a backlog of about $50,000,000 along with a favorable outlook for additional business, and possessing one of the industry's highest productive capacities, North American may again establish a new high in both sales and earnings when results for 1940 are recorded.

Aviation Corporation was one of the few companies in the industry to have operated at a loss last year. For the fiscal year ended November 30, 1939, the company showed a net deficit of $2,238,049 after all write-offs. Aviation Corporation in its present form represents a different company than it was a number of years ago. Its principal manufacturing subsidiary, Aviation Manufacturing Corporation has greatly simplified its operations and recently completed a new plant in Nashville, Tennessee. Vultee, albeit still controlled, is no longer a wholly-owned subsidiary. Aviation Corporation has maintained its investment in $2,422,112.50 of American Airlines convertible debentures and also owns 183,478 shares of Pan American Airways. Both of these investments aside from representing a substantial unrealized profit to Aviation Corporation gives the company control of about 9.5% of the capital stock of Pan American Airways and a potential ownership of 35% of American Airlines capital stock to be outstanding.

Control of Aviation Corporation reposes in Aviation & Transportation Corporation which owns 1,129,428 or 28.9% of the former's capital stock outstanding. Recently, new interests entered the picture, when General American Transportation Corporation acquired 160,895 shares or 7.2% of Aviation & Transportation's common stock. General American also owns 84% of the common stock of Barkley Grow Aircraft. It is believed that General American Transportation, primarily a railroad car builder and lessor, is entering the aviation industry so that it may supplement its basic function and be represented in all phases of transportation.

Evidently Howard Hughes means to own an airline. In addition to the consistent market purchases of TWA stock, the Hughes Tool Company, controlled by Howard Hughes, has agreed to purchase 119,154 shares of unissued stock of the airline at $14 per share. Together with previous purchases, this would give Hughes an interest in 290,454 shares or 30.6% of the total of 950,000 shares of TWA to be outstanding. The first Hughes purchase of about 100,000 shares was made a year ago at approximately $10 per share. The bulk of subsequent acquisitions were made at only slightly higher levels.

*The financial listings of the individual companies are on page 84.*

## Fairchild Trainer

(*Continued from page 54*)

pared by its manufacturer so that a single piece covers the whole top of a wing panel and extends around the leading edge back to the bottom of the front spar. This means that there are no joints or seams in the covering in the main part of the upper wing surface.

The tail surfaces are cantilever with fixed surfaces being mahogany plywood-covered units treated in a similar manner to the wings, built up from spruce spars and ribs. Movable surfaces are a composite steel and aluminum alloy structure, fabric-covered and are dynamically balanced. Cockpit-controlled tabs for longitudinal balance are provided in the elevators. All controls, bellcranks, etc. are mounted on ball bearings, and elevators are interchangeable right and left for easier replacement of spares.

The landing gear is of the cantilever type, having vertical motion of 8 inches equipped with 6.50" x 10" low pressure tires, having a tread of 9 feet 4 inches. The tailwheel is steerable through full range of rudder travel and automatically disconnects to become full swiveling for spot turns and hangar handling. Hydraulic brakes of the expander tube type are provided and also a parking brake controllable from both cockpits is supplied.

Two tanks of 22½ gallons capacity each designed with expansion space are provided, one in each wing, giving the ship four hours' range. The fuel system is of the pump feed type, and an auxiliary wobble pump is provided which can be operated from either cockpit.

A Ranger 6-440 C-2 engine is used. It develops 175 hp. and can be run on 65 octane fuel. Engine is of conventional Ranger design being 6-cylinder air-cooled inverted inline type. The metal propeller is standard equipment of the McCauley steel type having detachable and adjustable blades and a diameter of 7 feet 2 inches. A direct drive hand turning Eclipse starter is provided with the handle located on the left hand side of the ship just forward of the wing.

Open cockpit arrangement is standard equipment with a suitable brace to protect the crew in the event of a turn-over. Cockpit enclosures are provided as extra equipment. These are of the sliding type, covered with Plexiglas and fully enclosing both cockpits. Each cockpit is equipped with a shock mounted panel offering space for 8 instruments. All instruments are recessed in a rubber crash pad, and fuel gauges are located one in each wing, visible from either cockpit.

*Performance:* Based on 175 hp. (65 octane fuel)

| | | |
|---|---|---|
| High Speed at sea level | 135 mph | 216 kph |
| Operating speed at sea level (75% power) | 120 mph | 192 kph |
| Cruising range | 4 hours | |
| Service ceiling | 16,000 feet | 4880 m |
| Rate of climb sea level | 835 ft./min | 250 mpm |
| Landing speed sea level | 48 mph | 77 kph |

*Specifications:*

| | | |
|---|---|---|
| Gross weight | 2450 lb | 1110 kg. |
| Weight empty | 1749 lb | 790 kg. |
| Useful load | 701 lb | 320 kg. |
| Overall span | 35′ 11 3/16″ | 11 m |
| Overall length | 27′ 8 3/8″ | 8.5 m |
| Height | 93″ | 2.3 m |